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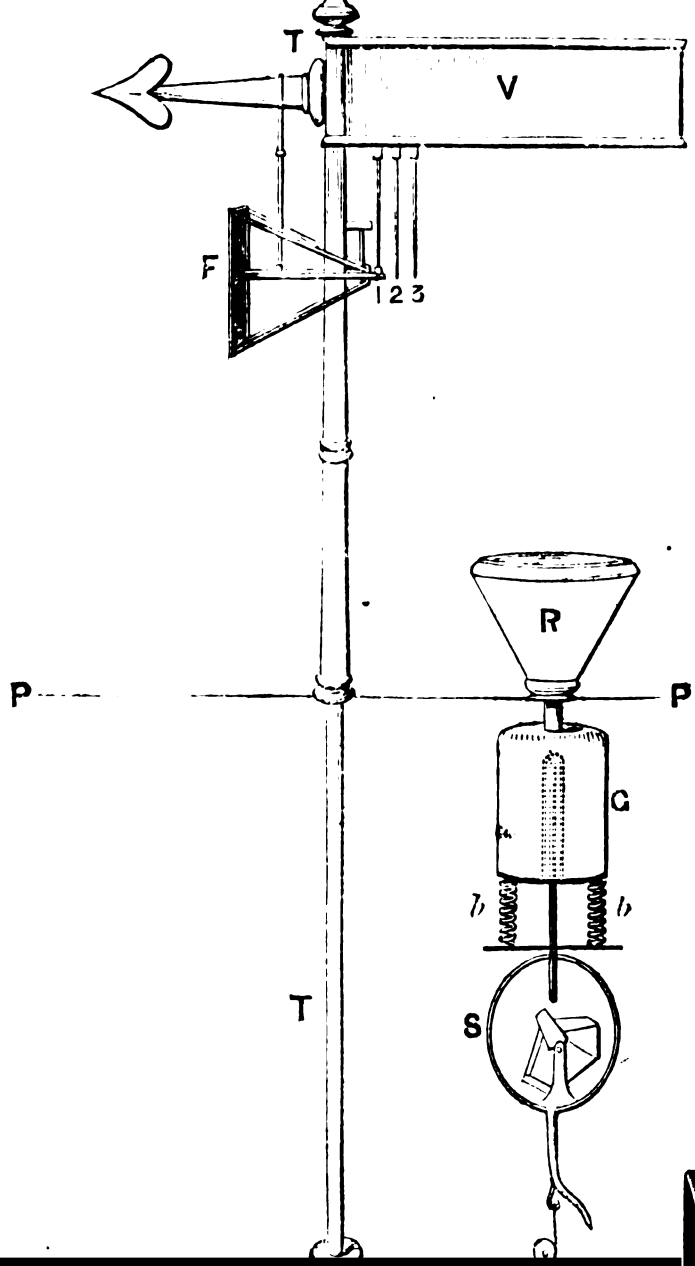

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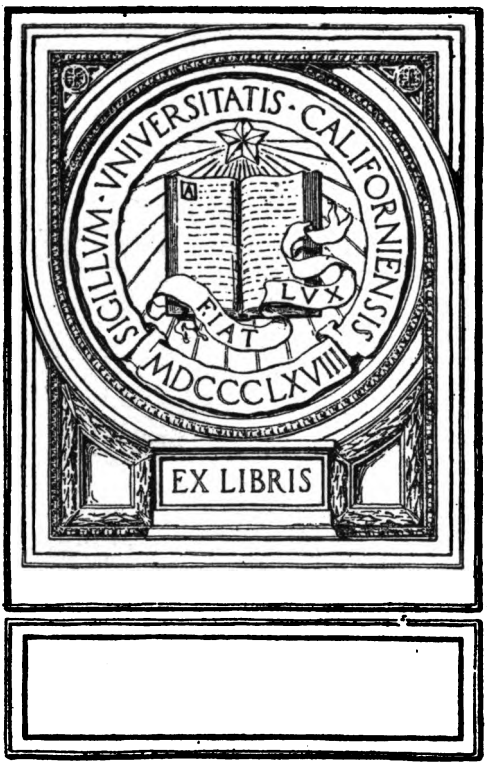

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SYMONS'S

(MONTHLY)

METEOROLOGICAL

MAGAZINE.

VOLUME THE FIRST.

1866.

UNIV. OF CALIFORNIA

LONDON:
EDWARD STANFORD, CHARING CROSS, S.W.,
AND ALL BOOKSELLERS.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

I.] FEBRUARY, 1866. [PRICE FOURPENCE, or 5s. per ann. post free

INTRODUCTORY.

I BELIEVE that it is a rule *not* to judge of a serial by its first number, and I hope that the rule will be adhered to in the present instance, since future numbers will, at any rate, receive more time and attention than the present one, which having to appear simultaneously with *British Rainfall*, 1865, has had to be cared for in scraps of time snatched from its more bulky *confrère*. But let not this semi-apology be construed as a promise of future brilliancy, on the contrary, I would now, as ever, rather promise nothing, and let all I do sink or swim by its own merits; still it may be well to state that I *hope* to give in future numbers, Tables of Foreign and Colonial Rainfall, Notes on Thunderstorms in England during 1856-7 and 8, also on those in 1864 (these are somewhat voluminous, and contain not only curious results as to colour, &c., of lightning, but also as to its mechanical effects); Notices of Meteorological Books, new and old; and, above all, the latest rainfall intelligence, both as to its fall, its measurement, its publications, and its instruments. Lastly, I need hardly say, that its future depends very much on its readers; if they will send me prompt and full information of any unusual occurrence in their neighbourhood, and if they will (if they think it good) recommend it to their friends, the two essentials of high quality and a paying circulation may be obtained; and so I may be able to enlarge it, though my maxim always is, say everything in as few words as possible.

G. J. SYMONS.

136, Camden Road, N.W., Feb. 7th, 1866.

ON THE STORAGE OF WATER FOR COUNTRY VILLAGES.

THE severity of the drought during the last two or three summers has helped to force public attention to a point not generally appreciated at its full import. I refer to the influence of drainage operations on the supply of water available for man and beast in the summer months and periods of drought. It is very desirable the

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present copious water supply should not obliterate the remembrance of recent want, and I therefore take this early opportunity of quoting Mr. Bailey Denton's last communication to the *Times*, and expressing a most earnest hope that something may be done.

To the Editor of the Times.

SIR,—The excessive rainfall of the present winter, following as it does three successive summers in which drought has been experienced, must, I believe, have satisfied all persons of the propriety of storing the excess of certain periods to supply the deficiency of others, and it cannot fail also to bring those who have watched the progress of drainage throughout the country to the conclusion that the collection of water discharged by drainage ought to be a part of the same operation with drainage itself, although with the valleys covered with water as they now are it may be hard to recall the fact that there were many rural places in which the poor cottagers were paying as much as 1d. a pail for water during the past summer.

In the first month of winter (October) we had a rainfall equal to half the fall of the previous six summer months, although in July and August there were extraordinary storms in which very heavy rainfalls occurred. From October up to the present time the rainfall has been above the average, the consequence of which will be that, as the subterranean supply will be fully replenished, and the crust of the earth more than satisfied, those lands that have been underdrained will continue to discharge water until we are well advanced into summer. We shall thereby have the means of storing water of the best quality after the present floods have passed away, thus showing that had storage reservoirs been at hand we should have been able to select either the inferior surface waters, which are now in excess, or the superior waters discharged from the under drains when the excess has passed away, and so provide for any coming drought.

For small towns and villages this mode of collecting a supply might be most economically carried out. Reservoirs sufficient to hold enough water for an ordinary village of 400 persons may be made, and the water conveyed down the village street, with proper stand-pipes, for about 1*l.* a head. In some instances several villages might combine for larger reservoirs, which in some cases might cost more, but in others, where circumstances favoured a combination, even less than the sum named.

I have the honour to be, Sir, your obedient servant,

J. BAILEY DENTON.

Seeing that even the £400 for which (if I understand rightly) Mr. Denton undertakes to construct his reservoir, lay down mains, &c., &c., is not easily available in every village, and recognizing fully the imperative necessity of some decided steps being taken to store our spare water for future use, I would suggest that labour and spades would alone be required for the following, which would store a great deal of water, good enough at any rate for nine-tenths of the purposes of life, and infinitely better than much that was used during the late drought.

The plan is simply this:—Choose a handy part of a brook, where the substratum is believed to be tolerably water tight and easy of excavation, and make a pit of such size, depth and breadth, as would be most convenient, right in the bed of the brook; it would be easy to carry the water in a trough while the excavation was going on, and, being for the good of each villager, perhaps they would take a turn at it instead of their gardens for one or two evenings a week until it was finished. The only objection I see at present is, that possibly though the brook current would pass *over* the pit-reservoir the water in

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it might stagnate slightly; this might be obviated by a partition of wood or brick run right down to the bottom of the pit, and having *there* an opening, the water must then be in constant motion, descending on one side, ascending on the other. A grating to prevent ingress of extraneous substances, and fence to keep out children, sheep, cattle, &c., a windlass, and perhaps, cover, would complete my small scheme, which I merely suggest, and leave others to criticise, and, perhaps, annihilate.

NOTABILIA OF JANUARY, 1866.

THE most general characteristics of the month have been its mildness, windiness, and wetness. In so large an area as the whole of the British Isles, exceptions always occur; this month the stations differing from the majority, and having had a dry month, are in the north midland counties of England, and the east of Scotland and Ireland. The south-east of England has had the greatest excess, much of which was attributable to the remarkable fall of snow on the 11th, which (as is not infrequently the case when snow falls heavily with an air temperature of 32°) was very dense, and almost sticky from its semi-fluid, semi-frozen state; such snow, of course, adheres with especial closeness to trees wet with the rain which preceded the snow; then came frost, binding all firmly on until even the telegraph wires were as thick as one's arm, and it is no wonder the break-down was almost universal in the district where the above conditions were fulfilled, which was generally the case in North Sussex, Kent, Surrey, Middlesex, Herts, and Oxford.

EXPLANATORY OF THE TABLE OF MONTHLY RAINFALL.

A very few words will suffice on this head. The order of the Stations is that in which they follow in *British Rainfall*; the Roman numerals refer to the divisions therein, and which correspond with those of the Registrars-General of England and Scotland, and of the Cattle Plague reports of the Privy Council Office. The heights of the gauges are the elevation of their receiving surfaces above the ground, and above mean sea level at Liverpool (=Ordnance Datum). The next column gives the total fall, and then follows the difference from the average of the past six years. No doubt this is a short period to adopt, but it was necessary to steer between two difficulties. If a long average (twenty years, for instance,) was held indispensable, then the stations must have been few and most irregularly distributed, or the column nearly all blanks. It has therefore been decided to adopt a medium course, and adopt the mean of the six years, 1860-5, the relation of which to the previous ten years, 1850-9, is fully shown in the annual tables for 1865, which are now in the press.

The headings of the other columns sufficiently explain themselves, save that the date of a rainfall is (in accordance with the rule now generally adopted) the day preceding that at 9 a.m. on which the amount was measured. It almost seems as if *all* had not quite understood this point, the dates this month being irregular.

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RAINFALL IN JANUARY, 1866.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground	Above Sea Level.	Depth of Rain. Total Fall.	Diff. from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which ·01 or more fell.
		ft. in.	feet.	inches.	inches.	inches.		
I.	Camden Town	0 6	100	3·90	+1·95	1·20	10	23
II.	Staplehurst (Linton Park)	0 6	200 ?	3·83	+1·77	1·35	11	21
,,	Selborne (The Wakes)	4 0	500 ?	6·23	+2·96	·73	14	20
III.	Hitchen	2 0	240	3·63	+1·49	·75	11	23
,,	Banbury	7 0	345	2·57	+ ·48	·28	31	22
,,	Wisbech	0 6	10	2·10	...	·41	22	18
IV.	Bury St. Edmunds (Culford)	1 2	...	2·48	+ ·61	1·02	13	12
V.	Calne	0 11	250	3·60	...	·50	10	20
,,	Plymouth (Goodamoor)	0 2	580	8·44	+2·42	3·76	13	20
,,	Barnstaple	0 6	31	5·44	+2·80	·70	11	23
,,	Taunton	1 6	38	5·15	+2·51	·81	11	23
VI.	Shrewsbury (Highfield)	5 6	200	2·40	+ ·78	·48	7	15
,,	Tenbury (Orleton)	0 9	200	3·00	+ ·47	·35	7	24
VII.	Leicester (Wigston)	0 6	220	2·08	+ ·10	·39	13	19
,,	West Retford	0 6	50	1·25	— ·27	·20	2	16
,,	Derby	5 0	180	1·60	— ·19	·21	12	19
VIII.	Manchester	2 7	106	3·25	+ ·76	·57	21	20
IX.	York	0 6	50	1·64	+ ·06	·26	14	17
,,	Skipton (Arncliffe)	3 0	750	10·11	+4·47	1·48	21	22
X.	North Shields	1 0	124	1·51	— ·60	·30	30	20
,,	Borrowdale (Seathwaite)	1 0	422	25·99	+9·63	3·03	21	24
XI.	Abercarn	1 3	450	8·92	...	1·10	15 & 21	18
,,	Haverfordwest	2 0	60	7·90	+2·85	1·19	6	21
,,	Rhayader (Cefnfaes)	2 0	880	7·42	+2·90	·91	2	24
,,	Llanberis (R. V. Hotel)	1 0	370	15·85	...	2·42	2	23
XII.	Dumfries	0 5	70	5·56	+ ·96	·55	30	21
,,	Hawick	4 0	580	4·85	...	·70	8	23
XIV.	Ayr (Auchendrane House)	2 3	94	8·30	+3·78	1·42	8	24
XV.	Otter House	0 6	130	10·89	+4·19	1·39	31	25
,,	Fort William	0 8	20	14·19	...	1·25	14	30
XVI.	Leven (Nookton)	0 6	80	2·80	— ·07	·37	30	19
,,	Stirling (Deanston)	0 0	130	6·96	+2·24	1·01	1	25
,,	Logierait	1 0	250	5·01	...	·66	2	18
XVII.	Ballater	0 10	656	2·87	...	·46	20	17
,,	Aberdeen	4 8	115	2·52	...	·48	12	21
XVIII	Inverness (Culloden)	3 0	104	2·47	...	·36	5	17
,,	Portree	0 4	60	19·17	+6·08	1·35	14	31
,,	Loch Broom	0 8	48	9·00	...	·86	14	31
XIX.	Helmsdale	1 0	34	2·63	...	·25	17	26
,,	Sandwick	2 0	78	4·33	+1·04	·52	1	27
XX.	Cork	6 0	65	6·76	...	1·04	2	22
,,	Waterford	4 0	60	5·42	+ ·56	·92	2	26
,,	Killaloe	5 0	128	6·63	+1·77	·90	12	25
XXI.	Portarlington	9 0	236	3·72	— ·29	·49	13	25
,,	Monkstown	0 6	100	2·59	— ·80	·48	30	21
XXII.	Galway	6 0	25	8·96	...	·77	12	27
,,	Bunninadden (Doo Castle)	1 0	...	6·55	...	·80	3	26
XXIII	Bawnboy (Owendoon)	1 3	218 ?	7·00	..	·72	3	27
,,	Waringstown	0 4	191	3·94	...	·47	2	21
,,	Strabane (Leckpatrick)	0 5	260	7·34	...	·81	3	23

+ Shows that the fall was above the average ; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ENGLAND.

CAMDEN TOWN.—Temperature of air above 50° on 13 days, the highest being 59° on 3rd. The temperature has seldom been known to exceed 55° in January, and there is believed to be no case on record of a temperature of 59°·0, or of 13 days with a temperature of 50°. The air only fell to freezing point on three days—11th, 12th, and 13th, but on the night of the 12th there was a short period of intense cold, a mercurial minimum thermometer *on* the snow fell to 9°·3.; the ordinary spirit thermometer only fell to 18°, but it was partially under the snow. Lunar halos on 4th, 21st, and 22nd. At 1·30 a.m. of 10th heavy rain began, lasting till 4 a.m., when it turned to snow, and by 9 a.m. the latter lay 6 inches deep, allowing for the rain; still the snow must have had a density far greater than ordinary, the total product when melted being 1·20 in.

LINTON PARK.—The most remarkable feature in the month was the snowstorm on the 11th, preceded by a heavy fall of rain, little or no frost until the evening, when the thermometer fell to 18°. Lightning had been seen on the two evenings preceding this, and the barometer fell 1·49 in. between the 8th and 11th. The snow drifted so as to render some of the lanes and highways impassable until they were cut, but with the exception of the 11th and 12th the weather was very mild.

SELBORNE.—A most tempestuous month, remarkable for rapid variations of temperature and pressure. The thermometer on the night of the 12th fell here to 15°; at Alton to 3°; at Chawton to 7°; here on the morning of the 13th it rose to 45°, being 30° in the course of the night. Loud thunder on 3rd, hail on afternoon of 8th, and aurora at night. On 11th, heavy snow from 1 a.m. to 3 p.m. Aurora on 15th, 17th, and 21st.

HITCHEN.—Heavy fall of snow commenced at 4 a.m. on 11th. Postal communication with London stopped, owing to melting snow in the valley between Stevenage and Buntingford.

BANBURY.—High winds and fluctuating barometer. Two inches of snow on the 11th, followed by high wind, from the joint effects of which the telegraph posts were broken. A little snow on 8th and 9th. Snowdrops and draba verna on 21st. No day on which the day temperature did not exceed 32°.

WISBECH.—Mean temperature of month 42°, which is 5°·3 above the average of January for six years. Air temperature only fell to freezing on five days. General health of locality good. Gale (15 lbs.) on 2nd, and (20 lbs.) on 8th. Lunar halo on 29th.

CULFORD.—The mildest January I recollect. Mean temperature 40°. Common crocus in full flower since the 8th, and, which is somewhat remarkable, it preceded the common snowdrop. Snow only fell on one day (11th), but it was then 5 in. deep.

CALNE.—Gale on 2nd; snow on the downs. Snowdrop and winter aconite in bloom on 5th. Heavy gale and hail on 8th. Snow on 9th, and 11th, four inches deep. Crocus in bloom on 18th.

GOODAMOOR.—Hail on 8th; snow on 9th. On 11th a hurricane came from E. and N.E., with hail, rain, and snow, doing great damage to the trees and buildings. It began about 1.30 a.m., and was most violent from 7.30 to 8.0 a.m. Thaw on 13th, and great floods in the rivers.

TAUNTON.—High wind on 2nd. Stormy, with snow, on 11th.

ORLETON.—A very warm and stormy month; frequent rains, but never very heavy. Some snow on 9th and 12th. Lunar rainbow on 22nd, at 9.15 p.m.

WEST RETFORD.—Great prevalence of high winds from S. and S.W. Snow on 9th and morning of 13th.

DERBY.—The fluctuation of the barometer this month has been remarkable, viz., from 28·709 in. on 9th, to 30·430 on the 26th. The gales, though frequent, have not been severe in the midland counties. The extreme mildness of the month is shown by the budding of the trees. Violets were gathered early in the month, and snowdrops are abundant.

MANCHESTER.—Snow and hail on 9th. Heavy snow early on the 12th.

ARNCLIFFE.—Very mild month, but with an unusually heavy fall of rain. Little or no snow.

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NORTH SHIELDS.—Heavy storm of snow and sleet on 1st. Snow daily from 9th to 13th—also on 29th. Lunar halo on 24th, 25th, 26th, and 31st. Solar halo on 30th. Pansy in flower on 17th, Christmas rose on 18th, furze on 19th, snowdrop on 21st, blue hepatica on 27th, polyanthus and red hepatica on 28th. Unusually mild.

SEATHWAITE.—Excessive rainfall and very high temperature. Frost only on three nights. Eleven days with more than an inch of rain—five with more than two inches. Monthly gauge gave 24·86 inches. Gauge on The Stye gave 34·12.

WALES.

ABERCARN.—Rainy month; heavy snowstorm on 11th. Range of barometer 1·55 inch.

HAVERFORDWEST.—General characters of the month were extreme wetness, gloom, and a prevalence of heavy gales, chiefly from the W., S.W., and N.W. Mildness has also been a prevailing characteristic; on one occasion only has the temperature fallen actually to the freezing point. Snowdrops were in full flower about the 15th of the month. The barometer has been chiefly remarkable for uniform low pressure and readings, rather than for any unusual extremes; in a word, I may say, it has been blowing heavily for at least two-thirds of the month, the only calm period being about the 23rd to the 27th, when the readings of the barometer were high; the sky during that time was generally overcast and the air calm. The month finished stormy, mild, and wet. Lightning and hail on 1st; lightning also on 9th. Hail on 11th.

RHAYADER.—Strong gales of wind from S.W. and N.W. during the whole month. Temperature very high. Snow on 11th; large flood in the Wye on 13th, and again on the 21st. Max. temp. 54°.

LLANBERIS.—Very wet month; more than an inch of rain on six days.

SCOTLAND.

DUMFRIES.—From the 2nd to the 9th very stormy and wet, with a violent gale on the 7th. Frosty from 10th to 12th, with heavy snow on the 11th. From 13th to 21st stormy and wet, with violent gale on 15th. From 22nd to 27th, six days very fine and mild for the season, the thrush and blackbird singing in the woods. Snowdrops in flower on 20th, and common blue hepatica on 26th. The last four days very stormy and wet, with snow on the 29th. The rainfall is 1·27 in. above the average of the previous sixteen years; during that period the rainfall for January has only four times exceeded that of present month—in 1851 the amount was 7·14; in 1852, 8·10; in 1860, 7·60; in 1863, 7·10 inches. The least fall was 1855, 0·55 in. The mean temperature 41°·0, has exceeded last January by 4°·7.

AYR.—The month has been characterized by excessive rain, fluctuating pressure and temperature—the latter being generally high, extremely violent S.W. winds. The great London snowstorm did not reach here with any severity—we only had one inch of snow. Rainfall nearly double our ten years average, and more than ever previously recorded in one month.

OTTER HOUSE.—Wet and stormy; very little snow, and that little soon disappeared. Rain 4·41 in. above the average. Lightning on night of 1st and 21st, with distant thunder; hail on 8th and 15th; snow on 10th and 11th. Storms on several days; in fact, the weather since December 19th, 1865, is well described by an eminent poet in the following couplet—

"The days are cold, and dark, and dreary,
It rains, and the wind is never weary."

NOOKTON.—January, like November and December, has been singularly mild, and also like them almost without frost or snow, but frequent wind-storms mostly from the S.W. High winds throughout the month; snow on 1st, 10th, 11th (5 to 7 p.m.) 29th.

FORTWILLIAM.—Temperature throughout the month was very mild, except in the first week. A considerable fall of snow on 3rd and 4th, but it did not lie long; a little snow fell also on the 28th.

DEANSTON.—Weather throughout the month very mild for the season, only six days without rain; very little snow, and what fell, melted on the following day. Snowdrops, hepaticas, &c., in flower in the middle of the month. 2 inches of snow on 1st; slight falls on 10th, 11th, 18th, 29th, and 30th.

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LOGIERAIT.—Altogether an exceptional month. At times (*e.g.*, from 22nd to 28th) we experienced lovely weather, with all the balminess of Spring, and a temperature such as none can recall for the month of January. Again we have had but very little snow, and though falling somewhat heavily upon the surrounding hills, never remained above three days. Owing partly to the melting of the snow and partly to the rainfall, the river Tay was in great flood for a fortnight, at one time gaining a height which it had not reached before for 17 years past. While we have had some wonderfully fine and spring-like weather during the month, the rainfall has been very great.

BALLATER.—Snow on 1st, 10th, 13th, 15th, 18th, 20th, and 29th, and frequent gales. Lunar halos on 24th and 28th.

ABERDEEN.—The month has been milder than usual, the mean temperature being 38°·1, which is 1°·8 *above* the mean of the ten years 1856—1865. The mean pressure 29·51 in. at sea level, is ·23 in. *below* the mean of the same period. Frequent heavy gales of short duration, but none accompanied the great depression of the barometer to 28·51 in. on 9th. On 2nd, 5 to 12 p.m., hurricane from S. and S.S.W.; on 3rd, a S.W. gale, lasting through the night. Aurora on 4th, nightly from 6th to 15th, on 17th, 21st, 23rd, 27th, and 28th. Lightning on 6th. Gale on 7th. Snow (half-an-inch) on 10th; snow also on 12th and 13th, with a gale on the latter day. Fog on 17th, and, at 7 p.m. a fine meteor with train of sparks. Lunar halos 23rd, 24th, 25th, 26th, and 28th. Snow on 29th and 30th.

CULLODEN.—Barometer 28·425 (corrected) at noon on 9th, having continued low since 31st December at 4 a.m., on which day it fell to 28·20 inches. These great depressions were caused no doubt by the severe and disastrous storms which prevailed over England and Scotland and in the Atlantic Ocean. Snow-drops in flower on 17th.

HELMSDALE.—Rain fell on every day but five; snow on 10th and 28th. The severe storm which visited the south was scarcely felt here.

PORTREE.—This has been the stormiest month ever remembered. Mean temperature 40°·4, mean pressure at sea level 29·44 inches. Minimum temperature 16·2 (on grass 9°·0) on 11th. Hail on 7 days, snow on 6 days, lightning on 21st, halo on 27th, meteors on 4th.

SANDWICK.—The month has been rather warmer and drier than usual, but a low barometer, 0·22 *below* the mean. The mean daily motion of the air has been 472 miles, against a mean of 441 miles. Thunder, lightning, and hail at 10 a.m. on 1st; hail at 3 p.m. on 7th, and again on 10th. A gale from 6 a.m. on 15th till 4 a.m. on 16th; horizontal motion 1000 miles in 22 hours, for 8 of which it averaged 50 miles an hour. On 21st there was a gale of 40 miles an hour from 2 till 7 a.m. Lunar halo at 8 p.m.

IRELAND.

KILLALOE.—The wettest January in 20 years except three, viz., 1849, 7·47; 1852, 6·85; 1860, 7·07. Frequent and violent winds throughout, mostly from S.W. Hail showers on 1st; violent storm on night of 7th from S.W. to W., and then from N.W.

MONKSTOWN.—A constant succession of gales until 22nd, those of 7th and 14th being most violent. Very little frost; min. 30°; max. of barometer 30·586 on 24th, min. 28·956 on 9th. Rain on an unusual number of days, but the amount not excessive. Temperature very mild. Fine double lunar rainbow at 8.30 p.m. on 2nd. Snow on 7th and 8th.

GALWAY.—Lunar rainbow on 20th, at 7 p.m.

DOO CASTLE.—This month remarkably wet and mild; birds singing the whole month. Snow on 1st, 8th, 9th, 11th and 12th.

OWENDOON.—Twenty-seven wet days, some very stormy ones, and some very mild; floods very high. Snow on 1st and 28th.

WARINGSTOWN.—Snow on 1st, 8th, 9th, 11th, and 29th. Heavy westerly gale on 8th. Max. temp. 54° on 15th; min. 24° on 11th. Frost on grass on 20 nights.

LECKPATRICK.—Very wet month; mild open weather; some severe gales. Sixteen nights with frost on grass. Mean temperature 39°·3 being 2°·4 above Mr. Glaisher's adopted mean for January at Greenwich. Here the means have been, January, 1863, =39°·4; 1864, =38°·2; 1865, =35°·5; 1866, =39°·3.

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MINIMUM THERMOMETER ON GRASS.

To the Editor of the Meteorological Magazine.

DEAR SIR,—I wish to inquire what is the usual practice of Meteorologists with regard to a point which I venture to think is not so trivial as it seems. I see frequent allusions to the "minimum on grass," and would venture to ask—What sort of grass? I have often placed thermometers on grass in different parts of our garden at Ripon, and have always found those placed on long and matted grass—such as grass that was cut for hay, or grazed generally is in winter—the lowest. 10° is the common difference, on a clear night, between a thermometer so placed, and one at 4 feet, close at hand and duly protected *on all sides* from the effects of radiation. For example, last Friday I registered the following temperatures—air 21·3, grass 7·5; and in the previous week, air 27·0, grass 16·0. I shall be very glad if any of your correspondents can clear up this question.

Charterhouse, Jan. 17th, 1866. F. W. STOW.

[The instructions hitherto issued on the placing of the minimum thermometer on grass certainly have been rather vague, and require more strict definition. Probably Mr. Glaisher's paper on the "Radiation of Heat at Night from the Earth," &c.—Phil. Trans. 1847, pp. 119–216—affords the best basis of such instructions, supplemented, perhaps, by the experience of observers generally. We may remark that when commencing observations with a thermometer on grass, we made use of a patch of turf about 2ft. in diameter, and on subsequently removing the instrument to a large grass plot the recorded minima were so much lower that we rejected all the previous readings. Has any one tried the effect of *simultaneous* readings on large and small surfaces of grass? As to the effect of variations from the length and quality of grass, the results arrived at by Mr. Glaisher were that long grass gave 1°·1 lower min. than short, and that if the thermometer was even one inch *above* the grass it would be 2°·8 warmer. There are several points well worthy of consideration. For instance, would it be well to adopt some substance of high but constant, radiating power, and not like grass varying with its daily growth; or is it better to let grass which has been our radiation measure for some years remain so, but try to make the conditions uniform at all stations. Again, the spirit minimum often reads 5° higher than Casella's mercurial minimum. Is it not imperative that *all* should use one or the other, or at any rate that it should always be stated *which* is used? Lastly, the Scottish Meteorological Society recommend a spirit minimum whose bulb is black glass, while those used in England are mostly, if not all, transparent spirit, in clear white glass. Comparison of these instruments should be made, and the results will find ready insertion in these columns.—ED.]

LATEST INTELLIGENCE.

[*Under this head we propose to notice events up to the moment of going to press, although full accounts will be reserved for the succeeding number, in order to give time for others to supply information bearing upon them.*]

THUNDERSTORM.—On SUNDAY, FEBRUARY 4th, a rather severe thunderstorm is reported from Rugby, Leicester, Chipping Norton, and various other places.

GALE AND LOW BAROMETER.—On SUNDAY, 11th, a severe gale in London. Barometer at Camden Town remarkably low—reduced to sea level it was—

9 a.m.,	29·249	3.0 p.m.,	28·663	4.15	28·619	5.30p.m.	28·615
1 p.m.,	28·835	3.15 p.m.,	·657	4.30	·606	6.0	·628
1.30p.m.,	·794	3.30 p.m.,	·640	4.45	·61	7.0	·663
2 p.m.,	·748	3.45 p.m.,	·629	5.0	·611	9 p.m.,	·802
2.30p.m.,	28·720	4.0 p.m.,	28·622	5.15	28·616	12th, 9 a.m.,	29·336

Rain from Jan. 1st to Feb. 12th at Camden Town is 6·22, the average being 2·20.

Unavoidably postponed—"Low Barometer at Scottish Lighthouses," by A. Cunningham, Esq. "Aurora of October 19th, 1865," by Dr. Rankin. "Floods at Port Louis, Mauritius."

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

II.] MARCH, 1866. [PRICE FOURPENCE, or 5s. per ann. post free

WATER SUPPLY FOR VILLAGES.

Mr. Leyland Woods, of Chilgrove, has kindly forwarded the following details of the plan he has adopted for his villagers, scattered over some 2,000 acres of the Sussex chalk hills, a plan which has the high merit of having been long (40 years) tried, extensively adopted, and not having failed even with the drought of 1864—in fact, much was in store when fresh rains came to replenish the cisterns :—

In those districts of England where surface-springs and constant streams do not abound, or where water has to be obtained from wells of great depth, a supply of good water in reasonable abundance is often very deficient in the cottages of the labourer. To overcome this great need, each cottage or pair of cottages should be supplied with an underground tank, in which the surplus water falling on the roof during periods of abundant rainfall can be preserved for future use. The advantages of these tanks have been so beneficially felt in this village during the dry seasons of the past few years, that I venture to give the result of my experience for the benefit of those who cannot help themselves without the provident care of the owner of the cottage or farm.

Cottages should be tiled or slated, and iron or copper guttering fixed under the eaves which will convey the rainfall, first into a galvanized iron cistern, containing from 50 to 100 gallons—this will supply the daily wants of a family in wet seasons without recourse to the pump. The overflow of these cisterns must be conveyed into the tank which is underground and covered over with an arch of brick. No air or light should be admitted into these reservoirs. The water is prescrved in greater sweetness and coolness than when exposed to the atmosphere. The method of building these tanks is, first to dig a hole of the required size, then build walls of stone, brick, or flint, about twelve inches thick, fill them well in with grouting or concrete against the earth, and make a concrete bottom of broken flint or brick ; cover in with an arch of brick, one or two courses in thickness, according to the strength required ; leave a man hole at the top and two holes at the ends, one to admit the water, the other for the overflow and for the admission of the lead pipe of the pump. After the walls have become tolerably dry, perhaps in a fortnight, coat the walls and bottom with a covering of good Roman cement, or with two or three courses of tiles laid in good grey lime mortar. All the work requires to be carefully and substantially done. In less than a month the tank will be ready for use, The water where admitted should not run down the walls, but empty itself through a piece of iron or earthen pipe, clear of the wall. The size of these tanks varies from 30 to 300 hogsheads, but one of 50 hogsheads will be sufficient for a pair of cottages. If the average rainfall of a district be about 30 inches, the quantity of water which would fall on the roof of a pair of good sized cottages may be estimated at about 200 hogsheads. This water will be sweet, cool, and wholesome, will require no filtering process, and is better than spring water for all household purposes, for brewing, for tea, and cooking, and especially for washing, as without soda, it will save more than half the soap.

A tank of 50 hogsheads will require to be twelve feet long, six feet wide, and six feet deep, inside measure. The hole will require to be dug out fourteen feet

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long, eight feet wide, and ten or eleven feet deep, thus allowing the arch to be entirely underground. To build such a tank, there will be required 18 tons of flints, 15 tons of sand and coal ashes, 10 quarters of lime, 5 casks of cement, and about 600 bricks for the arch, if only one brick in thickness. The cost of digging out will be about 30s., or 40 yards at ninepence, and the bricklayer's work about £5, without reckoning the cost of the carriage of materials. The tank can thus be built for about £14; a galvanized cistern 36 × 30 × 24 inches would cost £2 10s., and the guttering and pump about £6. For the sum of about £22, two families can be supplied with excellent water. When wells vary in depth from 100 to 300 feet, the labour of drawing water is very great, and falls chiefly on the man on his return home from a hard day's work. With a tank the wife or child can pump as the water is required. A cottager would cheerfully pay an additional rent of ten shillings for such a supply of good water.

W. LEYLAND WOODS.

FLOOD AT PORT LOUIS, MAURITIUS.

Lat. 20° 9′ S.; Lon. 57° 31′ E.

February 12th, 1865.

THE destruction of life and property occasioned by this flood having been very great, and the investigation into its cause very complete, I have had much pleasure in extracting a brief narrative from the official report (for the loan of a copy of which I am indebted to my friend, Rev. G. H. Billington).

It appears that the town of Port Louis is not very much above high water level, and that some small streams, having their origin in the hilly country at the rear of the town, pass through it in open channels, which also act as drains. No violent floods having been experienced for many years, these watercourses seem to have been gradually encroached upon and contracted; added to this, one of them had been diverted, and some arrangement made for discharging the water by means of a self-acting syphon. It, however, acted the wrong way, and brought sea-water into the town. I gather from the report that the reasons for diverting this stream was, that a new railway station had been erected where the stream used to discharge into the harbour.

It is unnecessary to enter at any length on the description of the catastrophe; it is sufficient to picture to oneself 5 feet deep of water running through the streets in the dark, and at a rate variously estimated at from 1 to 20 miles per hour; people clinging to the trees till they were swept away, a grindstone 4 feet in diameter carried several yards, an iron boiler several miles, two cases, each containing a portable forge, washed away, one being carried right into the harbour.

A Commission having been appointed, several suggestions as to alterations and improvements in the channels were made, but they, of course, have nothing to do with the rainfall. It was clearly shown that the flood arose, not from rainfall *at* Port Louis, but on the hills at its rear. It does not appear to have arisen from the bursting of a waterspout, because then the heavy fall would have been of limited area, but it does seem that the Commissioners were fully justified in offering the following explanation:—

The Committee, then, taking into consideration that the extreme heat (mean temp. 82°·9) which had prevailed throughout the latter part of January and the early part of February, had rarefied the air to an extraordinary extent, that the usual trade winds had been considerably diminished in force, that no bad weather had been experienced for some time previous to the flood, that the utmost velocity of the wind never approached within 35 miles of its ordinary rate in a hurricane, that the barometer only fell ·206 inches between noon of the 4th and noon of the 11th, and ·312 inches between noon of the 11th, and 4 p.m. of the 12th February, and that the total rain which fell from 9½ a.m. on the 12th, to 9½ a.m. on the 13th was only 7·46 inches, do not consider that the flood of the 12th February was in any way due to the presence in the neighbourhood of this island of an ordinary cyclone; but they believe that a mass of aqueous vapour, drawn from the equator towards the island in consequence of the rarefaction of the atmosphere,

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which extended to a considerable distance, meeting with the mountains in the northern and north-western portions of the island, was thrown up by those barriers in accumulated masses into a colder region than that in which they were first floating, and that the moment of complete saturation of the atmosphere having arrived, rapid condensation took place, and the aqueous vapour poured down in the tremendous flood of the 12th of February last.

Rainfall in different parts of the island from 9½ a.m. on 12th, to 9½ a.m. on 13th February, 1865.

	Inches.		Inches.		Inches.
Mont Choisy	6·57	*Port Louis.....	7·46	The Braes	12·25
Les Roches.....	9·21	Gros Caillon	10·05	Cluny	9·86
Labourdonnais	10·47	Croft-on-Righ	14·65	Gros Bois	4·03
Lucia	13·11	Espérance	10·24	Beau Vallon.....	4·87
La Gaieté	18·30	Trianon	11·62	St. Aubin	5·22

Greatest Fall in 24 hours, at Port Louis, in each year, from 1853 to 1865.

1853.	April 9 ... 2·87	1858.	Jan. 16 ... 5·04	1862.	May 25 ... 3·24
1854.	,, 19 ... 4·02	1859.	Dec. 5 ... 4·30	1863.	Jan. 13 ... 3·17
1855.	Feb. 4 ... 5·38	1860.	†Jan. 27 ... 11·65	1864.	Feb. 11 ... 2.45
1856.	April 24 ... 2·72	1861.	Feb. 16 ... 10·00	1865.	Feb. 12 ... 7·46
1857.	Jan. 28 ... 9·55				

C. MELDRUM,
Superintendent of Observatory.

REMARKABLE AURORA BOREALIS, OCTOBER 19TH, 1865.

To the Editor of the Meteorological Magazine.

SIR,—On Thursday, the 19th October, 1865, at a quarter to seven, p.m., an auroral arch, of a yellow colour, originated in the N.E. and proceeded quickly to the S.W. (Reid and Dove's poles of the wind), becoming thin and filamentary till it nearly touched the distant hills in the S.W., thus spanning the sky, and dividing it into two equal parts, as if marking out the boundary of the coming aurora. The wind was from the N.E., and seemed to bend part of the arch, sometimes to the S. and sometimes to the N. In about half-an-hour the arch slightly moving to the S. disappeared beyond the belt of Orion; when in the N.W., and in the direction of the magnetic pole, small streamers were observed, pointing to the zenith; they gradually extended to the west and east, completely filling one-half of the sky as marked by the arch, and giving a light nearly equal to the full moon. The coruscations, or streamers, were brilliant; at one time waving to the right, and at another time to the left hand. A more beautiful display of aurora borealis than this I have never seen, not even in Zetland. The aurora disappeared about 10 p.m., but the horizon to the N. continued to be illumined most of the night. Falling stars were observed at the time, followed by rain and a hailstorm.

Piazzi Smyth remarks, that "during an aurora, there is no lightning;" now, it is probable, that as lightning restores to an equilibrium the electricity or magnetism of the lower regions of the atmosphere, the aurora may do the same to the higher regions.

This aurora was observed at Selborne, Wisbech, Orleton, York, North Shields, and Haverfordwest in England; at Aberdeen, Otter House, Scourie, and Sandwick, in Scotland; at Monkstown, Galway, and Doo Castle, in Ireland.—*Symons's Rain Circular, October.*

WILLIAM RANKIN, M.D. and M.B.M.S., &c.

Otter House, 31st January, 1866.

*At Port Louis Observatory the gauge is 40 feet above ground, and 70 feet above mean sea level; the fall up to the same hour on the 11th was 2·23 inches, and on the 12th, 2·75 in.

† It is doubtful if 11·65 fell in January, 1860. The soldiers who took the observations that year did not, in my opinion, record the fall correctly. 90·34 was stated to be the fall that year, which is more than double any year before or since. Rainfall on that day is stated by the Meteorological Society of the Mauritius as 5·82 in.

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RAINFALL IN FEBRUARY, 1866.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground		Above Sea Level.	Depth of Rain. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which ·01 or more fell.
		ft.	in.	feet.	inches.	inches.	inches.		
I.	Camden Town	0	6	100	3·72	+2·50	·49	9	18
II.	Staplehurst (Linton Park)	0	6	200 ?	4·55	+3·04	·62	11	20
,,	Selborne (The Wakes)	4	0	500 ?	5·47	+3·76	·94	11	19
III.	Hitchen	2	0	240	3·28	+2·02	·70	12	20
,,	Banbury	7	0	345	2·30	+ ·87	·35	11	24
,,	Wisbech	0	6	10	2·52	...	·49	27	17
IV.	Bury St. Edmunds (Culford)	1	2	...	3·59	+2·17	·68	26	15
V.	Calne	0	11	250	3·98	...	·60	1	21
,,	Plymouth (Goodamoor)	0	2	580	6·52	+3·16	1·24	14	23
,,	Barnstaple	0	6	31	4·56	+2·48	·75	1	21
,,	Taunton (Fulland's School)	1	4	...	4·05	...	·70	1	20
VI.	Shrewsbury (Highfield)	5	6	200	2·18	+1·04	·37	7	14
,,	Tenbury (Orleton)	0	9	200	3·02	+1·45	·52	12	23
VII.	Leicester (Wigston)	0	6	220	2·78	+1·44	·48	12	19
,,	West Retford	0	6	50	2·25	+1·11	·49	11	20
,,	Derby	5	0	180	2·25	+ ·77	·31	11	20
VIII.	Manchester	2	7	106	2·98	+1·03	·44	6	20
IX.	York	0	6	50	2·50	+1·12	·68	11	22
,,	Skipton (Arncliffe)	3	0	750	9·15	+5·47	1·32	5	16
X.	North Shields	1	0	124	1·78	+ ·25	·31	11	20
,,	Borrowdale (Seathwaite)	1	0	422	19·17	+7·79	2·30	22 & 25	24
XI.	Abercarn	1	3	450	7·07	...	2·00	10	17
,,	Haverfordwest	2	0	60	5·41	+2·55	·80	10	20
,,	Rhayader (Cefnfaes)	2	0	880	6·03	+3·05	·78	6	21
,,	Llanberis (R. Victoria Hotel)	1	0	370	...	...	...	...	...
XII.	Dumfries	0	5	70	3·00	+ ·45	·42	6	17
,,	Hawick	4	0	580	4·02	...	·48	6	22
XIV.	Ayr (Auchendrane House)	2	3	94	5·30	+1·94	·78	6	21
XV.	Otter House	0	6	130	7·41	+3·49	1·07	6	22
,,	Fort William	0	8	20	9·03	...	1·55	5	25
XVI.	Leven (Nookton)	0	6	80	4·10	+2·40	1·02	14	19
,,	Stirling (Deanston)	0	0	130	5·91	+2·91	1·11	5	21
,,	Logierait	1	0	250	3·73	...	·77	5	18
XVII.	Ballater	0	10	656	3·25	...	·50	14	21
,,	Aberdeen	4	8	115	2·89	...	·87	14	23
XVIII	Inverness (Culloden)	3	0	104	2·41	...	·35	22	20
,,	Portree	0	4	60	10·90	+ ·67	1·70	5	23
,,	Loch Broom	0	8	48	9·42	...	1·42	5	26
XIX.	Helmsdale	1	0	34	4·36	...	·95	5	21
,,	Sandwick	2	0	78	5·63	+3·15	·95	5	24
XX.	Cork	6	0	65	2·61	...	·64	8	14
,,	Waterford	4	0	60	2·70	+ ·67	·49	8	22
,,	Killaloe	5	0	128	5·51	+2·60	·75	24	22
XXI.	Portarlington	9	0	236	2·99	+ ·96	·31	7	25
,,	Monkstown	0	6	100	2·30	+ ·66	·43	6	22
XXII.	Galway	6	0	25	4·64	...	·38	6 & 25	23
,,	Bunninadden (Doo Castle)	1	0	...	3·88	...	·45	6	25
XXIII.	Bawnboy (Owendoon)	1	3	218 ?	4·48	...	·68	6	21
,,	Waringstown	0	4	191	2·53	...	·31	7	24
,,	Strabane (Leckpatrick)	0	5	260	4·09	...	·48	24	27

+ Shows that the fall was above the average; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

[ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; and T S for Thunderstorm.]

ENGLAND.

CAMDEN TOWN.—A wet, uncomfortable month. Vegetation very forward, until checked by frost on 18th; Lilacs in bud on 3rd; T S at 10 p.m. on 4th; sleet on 13th; snow on 26th, ¾ in. deep. Max. temp. 55°·8 on 1st; min. 25°·2 on 18th.

LINTON PARK.—Excepting from 18th to 22nd, the month has been dull and very wet, the ground being too heavy for anything to be done with it. T S on night of 4th; heavy gale on 11th, doing much damage to trees. Max. temp. 57° on 7th; min. 23° on 18th.

SELBORNE.—Very tempestuous month, on 11th a barn was blown completely down; T on 2nd; hail on 4th at 11 p.m., and on 8th at 1.30 p.m.; aurora on 10th, 12th, and 13th. Max. temp. 54°·5 on 7th; min. 22° on 18th.

HITCHIN.—Snow on 27th; L on 4th; lowest bar. for 17 years on 11th.

BANBURY.—T S on 4th at 8.30 p.m., L unusually bright and *blue;* several persons injured in this neighbourhood, but none killed. Hail, T, and aurora on 7th. High wind and T on 11th; L and snow on 12th. Bar. on 12th [? 11th] at 5 p.m., 28·483.

WISBECH.—On 4th T S, L at 6 p.m., and a gale (15 lbs.) at 8 p.m. Solar halo on 14th; Lunar halo on 25th. Bar. min. on 11th, 28·708; max. temp. 53°·8 on 8th; min 26° on 18th

CULFORD.—Heavy T S on night of 4th, vivid L and hail; snow on 13th, 26th, and 27th. Max. temp. 55° on 7th; min. 16° on 28th.

CALNE.—Hail on 4th, 7th, and 8th; L on 4th in evening; snow on 12th, 26th, 27th, and 28th. Primrose and wild strawberry in bloom on 23rd, apricot on 24th.

GOODAMOOR.—On 3rd, at 11 a.m., there came on a furious squall or whirlwind, with L and T, it only lasted 10 minutes, but ·12 in. of rain fell, many trees were blown down and buildings damaged. On 4th, loud T, and stormy at night; L also on 5th and 7th; T S on 9th and L on 11th.

TAUNTON.—Owing to the lamented death of Dr. Gillett, the return from Fulland's School has been adopted, having been kindly supplied by Mr. Reed.

ORLETON.—Warm, rainy and stormy, until 12th; frosty, with occasional snow afterwards. Violent T S on 4th from 7 to 8 p.m., with violent wind, L began in N.W. soon after dark, at 7 p.m. became brilliant, at 7.15 very loud T, at 7.28 a vivid flash of pale white L struck an elm within 400 yards of this house, at 8 p.m. the L passed off to S.E. Distant T on 7th, and L at night.

WIGSTON.—Rain more than double our average. An awful T S, with hail, on the evening of the 4th, lasting about an hour. Considering the time of year, so violent a storm is not recollected. On 7th, temp. 52° at 8.30 a.m.

WEST RETFORD.—Very high winds during the first week. On 4th, from 6 to 6.45 p.m., T S with a N.W. gale.

DERBY.—Mean max. temp. 47°·3, mean min. 34°·2; max. 53°, min. 25°.

MANCHESTER.—After the first nine days, the mean temp. was generally low.

YORK.—On 4th, T S in evening. Snow on 21st and 28th.

ARNCLIFFE.—Very wet at beginning of month, changeable afterwards. On 7th T S. Max. temp. 42° on 10th; min. 22° on 14th.

N. SHIELDS.—Snow on 5 days. Aurora on 5th, 7th (with luminous arch), 12th, and 13th. Hail on 6th, 27th, and 28th. Lunar halos on 1st, 25th, and 26th. L on 4th and 7th. Yellow aconite in flower on 4th, crocus on 7th, and heath on 17th.

SEATHWAITE.—February was distinguished by a succession of boisterous winds and heavy rains. There were 8 days with more than an inch of rain, and 4 with over 2 inches. Snow on 14th, 27th, and 28th, but only slight.

WALES.

ABERCARN.—Wet and boisterous until 15th; fine and cold afterwards. At 8 p.m. on 4th, a heavy T S. with very vivid L and a gale of wind. Very heavy rain on 10th, with high N.E. wind. Snow on 12th, 13th, and 25th to 28th.

HAVERFORDWEST.—February has furnished almost every variety of weather; exceedingly stormy, with low barometer pressure; at times very mild, uniformly

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wet, yet no very heavy falls, the heaviest, ·80, on 10th, accompanied by a severe gale. About this date the weather became much colder, and continued so with varying degrees of severity to the end of the month. The 17th and 18th, and from 25th to the end were characterized by much severity, which affected the health of the community very sensibly, the more so coming at the close of so remarkably mild a winter. Very stormy at night on 4th, with T S and heavy rain. L on night of 16th and 26th. First snow this winter on 13th.

RHAYADER.—T S at 2.30 p.m. on 3rd; and a heavy T S with extremely vivid L at 7 p.m. on 4th. Snow on 13th, 27th, and 28th. Tom Thumb geranium in full leaf in open ground, unprotected, on 8th; snowdrops, crocuses, &c., in blossom. Thrushes singing during the whole month.

SCOTLAND.

DUMFRIES.—Stormy, warm, and wet, frequent snow after 12th. On evening of 7th a beautiful luminous arch, double the breadth of a rainbow, spanned the heavens from E. to W., and from horizon to horizon. The bow was white, pure and brilliant, of a fleecy-looking texture, through which the stars were visible, particularly the Pleiades. The bow was visible about an hour, disappearing about 8.30 p.m. There was sheet L before and after the appearance of the arch, and after midnight a bright aurora.

HAWICK.—Snow on 26th, 27th, and 28th.

AYR.—Snow on 13th (4 in. deep), 14th, and 24th. Hail on 3rd and 8th. T S at night on 8th; L at night on 22nd. On 6th, at 10.10 a.m., a heavy squall from W.S.W.; only lasted 4 minutes, but blew down 11 trees, all laid to N.E. Max. temp. 51° on 4th. Min. 22° on 17th.

OTTER HOUSE.—Weather more like beginning of winter than of spring. Stormy. Rain nearly double our average, alternating with hail and snowstorms. T S on 3rd, 7th, and 9th. Aurora on 7th, 12th, and 13th. On 15th, 6 inches of snow. Snow still (28th) on distant hills, but it has all gone from the valleys; it has, however, become colder, and the ther. is at 19°, being the lowest this winter.

FORT WILLIAM.—Gale from S.W. on 5th. T on 7th. Snow on 13th, 23rd, 25th, 27th, and 28th, with hard frost on the last day.

NOOKTON.—Severe wintry weather, frost, snow, and high winds. Min. 23° on 21st.

DEANSTON.—Very stormy on night of 3rd, with hail and some L. Great gale on night of 4th; many trees uprooted. Snow on 13th, 8 in. deep. T and L on 21st. Frequent snow and hail showers, and wet stormy weather. Max. temp. 47°·4 on 1st. Min. 16°·8 on 21st.

LOGIERAIT.—Upon the whole a fine month, but we have had two heavy falls of snow, and more frost than in any previous month this winter. On the 28th the Highland Railway became blocked with snow, for the first time this season.

BALLATER.—A very stormy month; several gales, the strongest on 6th, uprooting trees, and doing other damage. Bright aurora at 11 p.m. on 5th. Remarkable meteor at 8.45 p.m. on 22nd.

ABERDEEN.—Hurricane from W. on 6th. L on evenings of 4th, 7th, 15th, and 22nd. Aurora every night but 8, viz., 2nd, 14th, 18th, 19th, 21st, 22nd, 26th, and 28th. The aurora on 7th was magnificent; one brilliant arch in N., another crossing the sky south of the zenith (through Orion) from W.N.W. to E.S.E. At times vivid flashes of L, when the second arch *disappeared*, reappearing again in a few minutes. The coincidence of the L, and the disappearance of this arch, happened more than once.

CULLODEN.—Very heavy S. to W.N.W. gale destroying many trees on 6th. T on night of 2nd, L on 6th, and T S on 22nd. Snow on 12 days.

PORTREE.—Colder and more stormy than usual, so much so, that the fishermen rarely got out to sea. The gale from midnight of 5th, to noon of 6th, did a great deal of damage, especially about 5 a.m. The church and manse of Snigort were much injured, most of the slates and lead roofing being taken off, and the windows blown in. Aurora on 13th, so bright as to cast strong shadows. T S on 4th, from 2 to 3 p.m, L all the evening; T on 5th; T S on 6th, from 4 to 6 a.m.; on 9th, at 7 p.m.

LOCHBROOM.—Weather very changeable, frost, rain, and snow constantly alternating; frequent heavy gales.

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HELMSDALE.—Changeable and disagreeable month; a succession of violent gales until 9th. Snowdrops in flower on 1st.

SANDWICK.—Rain double the average; temp. below it. Gales on 6th, 7th, and 23rd, of 50 miles an hour. T S on 22nd. Aurora on 9 nights; on 14th with well defined arch. Remarkable fire-ball on 22nd, about 8.30 p.m., larger than the moon, and moving from N.E. to S.W.

IRELAND.

WATERFORD.—February is usually one of our driest months, but this year it has been damp and drizzling, and the latter part very cold.

KILLALOE.—The wettest February but one (1848 = 7·76) for 20 years, with sudden changes and violent winds. On 4th, at 1.30 p.m., violent storm, continuing till night, at 4 p.m. T S, and much sheet L at night.

MONKSTOWN.—Severe gale at 9 a.m. on 4th; bright sheet L at 8 p.m. in S.E.; no clouds at the time. Bright aurora with arch, but no streamers, on 7th. On 16th a heavy fall (about five miles from here) of *pellets* of snow, which in 15 minutes covered the ground some inches deep.

GALWAY.—On 7th, aurora, followed by T.

DOO CASTLE.—A wet month, with frequent snow. T S on 2nd and 4th, at night.

OWENDOON.—First severe month this winter; last few days intensely cold. T on 8th.

WARINGSTOWN.—Very stormy and wintry month; latter part generally frosty, with snow. Tremendous squalls, with T, L, and hail, on 4th.

LECKPATRICK.—Very similar month to February, 1865; same mean temp., same number of frosty nights, but rather more rain. Snow at times.

THUNDERSTORM ON FEBRUARY 4TH.

In addition to the many notices given in the Observer's Notes, the following are interesting, as showing how general, and how nearly simultaneous was the storm on this evening:—

RUGBY, 4th February, 1866.—(Frederick Fuller, Esq.)—A severe storm of lightning, wind, hail, and rain, commenced at 6.30 p.m., and lasted until 8.30 p.m. Wind S.W. Thermometer 42°; barometer (corrected) 29·533. The amount of rain and hail that fell was ·34 of an inch. The storm commenced to the north of the town, and went round by the west to the south. The previous part of the day had been windy and unsettled.

CHIPPING NORTON, KINGHAM.—(Rev. J. W. Lockwood.)—We had a violent hailstorm, with vivid lightning for about ten minutes. Although the hail was very heavy, no damage was done.

LINCOLN.—A terrific storm of thunder and lightning, with hail, rain, and fierce gusts of wind, broke over Lincoln on Sunday evening. The flashes of lightning were awfully vivid and brilliant, while the thunder burst forth in majestic peals, the rain meanwhile pouring down in torrents, and the wind raging with great violence. Altogether it was a most fearful storm, and produced terror and alarm in the minds of many, the congregations at the various places of worship being evidently greatly affected. Such a phenomena at this season of the year is of very rare occurrence. We have not heard of any serious damage being done by it. The west window of St. Nicholas' Church, Mewport, was blown in, and also several squares of glass in the other windows. The congregation became greatly alarmed thereby, and many rose to leave the edifice, but happily, through the exertions of two or three gentlemen, their fears were quieted, and the service was proceeded with.

MARLBOROUGH COLLEGE.—(Rev. T. A. Preston.)—We had no storm here, but lightning was seen, and at Salisbury there was a heavy thunderstorm with hail, between 11 p.m. and midnight.

BROMSGROVE.—(G. Dipple, Esq.)—Violent thunderstorm from 7.30 to 8.30 p.m.

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BAROMETER DURING THE GALE OF DECEMBER 31ST, 1865.

Northern Lighthouse Office, Edinburgh,
February 2, 1866.

SIR,—Will you permit me to direct attention to the following remarkable facts connected with the barometer on the occasion of the late severe storm of 31st December last?

The Commissioners of Northern Lighthouses get from all their lighthouse stations monthly statements which embrace a daily return of two readings of the barometer. The lightkeeper at the Butt of the Lewis (170 feet high) returned the lowest reading of the barometer during the gale of the 31st December last as 27·50, which, reduced to the sea level, gives 27·691. There could be no mistake in the figures, as they were twice distinctly stated; but it was so unprecedentedly low for this climate that it could scarcely be credited. It is very remarkable how general the fall on the north and north-west coasts of Scotland has been, and how completely the return of the Butt lightkeeper is borne out. I send you a note of some stations with the actual return, the height of the lighthouse, and the reading reduced to the sea level:—

	Actual Return, lowest reading on Dec. 31, 1865.	Height of Lighthouse.	Return Reduced to Sea Level.
North Unst, Shetland	27·76	230	28·01
Whalsey Skerries, do.	27·85	145	28·01
Bressay, Lerwick, do.	27·97	105	28·09
Sumburgh Head, do.	27·80	300	28·13
N. Ronaldshay, Orkney	27·88	140	28·03
Start Point, do.	28·00	100	28·11
Hoy Lowlight, do.	27·57	55	27·63
Cantick Head, do.	27·91	115	28·04
Noss Head, Caithness	28·00	175	28·19
Pentland Skerries do.	28·04	170	28·23
Dunnet Head, do.	27·73	346	28·11
Holburn Head, Thurso	28·01	75	28·10
Cape Wrath, Sutherland	27·76	400	28·20
Stornoway	28·43	56	28·50
Island Glass, Harris	28·16	130	28·31
Ushenish, South Uist.	28·80	176	28·00
Barra Head, Barra	27·44	680	28·14
Monach, W. of Hebrides	27·75	150	27·92
Skerryvore	28·24	150	28·39

Even on the north-west coasts of the mainland the effects were felt—

Rona, Skye	27·79	222	28·04
Ardnamurchan	28·08	180	28·28
Sound of Mull	28·30	65	28·38
Lismore	28·30	105	28·42

These quotations are all, even the highest, unusually low, and may prove interesting to scientific inquirers on such subjects.—I am, &c.,

ALEX. CUNNINGHAM, *Sec.*

[The gale on 31st, blew at Sandwick (at 7 a.m.), 60 miles per hour. At Culloden, at 4 a.m., 31st, the barometer fell to 28·20 in., fully corroborating the above remarkably low readings.]—ED.

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ON A PERIODIC (?) FALL OF SOFT HAIL, OR SNOW-BALLS, ON MARCH 8TH.

The following paragraph in my "Meteorological Report," for March, 1859, published in the *Times* early in April of that year, I reproduce verbatim, and append fuller details, since subsequent experience seems almost to have rendered the supposed periodicity an established fact :—

1859.—March 8th, from 4.45 to 4.58 p.m., an ordinary hail shower from N.W.; at 5.20, another nimbus from the same point began to discharge balls (stones I cannot call them, as they were soft, like miniature snowballs of ·2 inch diameter), which whitened the ground, and drifted in clouds like sleet, though when melted they only yielded ·02 inch of water.

There was much positive electricity, and the temperature fell nearly 13 degrees. The delicate rose-pink of the clouds around the setting sun contrasted with the dark hail-cloud hurrying away to S.E., had a very beautiful effect.

At Bungay (Suffolk) a violent thunderstorm from N.W., at 11.30 a.m.

It is perhaps worthy of note, that on the same day, in three successive years, a somewhat similar fall has occurred; the large hail-balls of March the 8th, 1857, will probably be remembered by many, even of your unscientific readers, as being an inch in diameter, and lying on the ground two or three inches thick; and further, Luke Howard, in his valuable "Climate of London," records a fall of "soft hailstones" on the corresponding day 40 years before (1817), his sketch of which strikingly resembles the photographs taken by Mr. Glaisher in 1857.

The paragraph in Luke Howard's "Climate of London," Vol. II., p. 325, is :—

1817, March 8th.—Windy; snow in flakes about 1½ in. in diameter; sleet and rain; at noon large cumuli in N., passing to cumulo strati, the sky above them being blue, to 15° of the cyanometer. About 2 p.m. a sudden shower of hail from a dense lofty nimbus; the balls were opaque, in the form of a cone, with a rounded base, about half an inch in diameter, and composed entirely of striæ, meeting at the apex of the cone. We have had similar hail repeatedly of late.

I next quote from my observation book, the account of the fall in 1857 :—

1857, March 8th.—Till 11 a.m. fine; at 11.18 a.m., hailstorm, which reduced the temperature of the air from 45·4 to 35·0; fair till 3 p.m. At 3.5 a very black cloud coming in a N.N.W. current, discharged balls of solidified snow, which till 3.12 did not exceed ½ an inch in diameter; by 3.15 they had increased greatly in size and number, the size of many of them being 1 inch long, and ½ to ¾ of an inch in diameter, the number being such as to cover the ground 1½ or 2 inches deep; they had also at this time assumed a most remarkable uniformity of shape and structure, presenting somewhat the appearance of a freshly-broken piece of iron pyrites, only crystallized at a somewhat more acute angle; they ceased even more suddenly than they began, for at 3.25 the sun was shining brightly; at 3.45, however, another change occurred; a very high wind suddenly arose, bringing with it a very heavy fall of snow, which again brought the temperature down so much, that the snow which fell on (or rather covered) my coat, was immediately converted into a tissue-like sheet of ice; this also was of short duration; it ceased at 4.5 p.m.

9th.—Several showers of snow in the early part of the day, but at 5.5 p.m. a very heavy one commenced, the wind being N.W., it shifted to N. and snow fell; to E. hail fell, and kept on oscillating N., bringing snow, and E. hail; this only lasted about 10 minutes.

10th.—A small quantity more snow.

Of the fall in 1858 no record is preserved, save that hail fell, and the depth when melted was ·047 in. The account of the fall in 1859 is given above. In 1860, a little snow fell. Nothing fell in 1861 or 1862. In 1863, hail fell at 2.15 and

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4.45 p.m. In 1864, there was a fall of ·030, but, being from home, I am not certain of its form; snow was reported in the neighbourhood. In 1865, there was a fall of snow at 4 p.m. (Snow also fell on 9th, and on 10th at 3 p.m.)

Lastly, in 1866 the fall of snow-balls, or soft hail, commenced at 0.50 p.m., when the temp. was 42·0, and the wet bulb 39·4, wind N., and the previous temp. 47·2; they ceased about 1.20, when the temp. had fallen to 34°·8 and 34°·6, the air having thus fallen 7° and become saturated with vapour in half-an-hour—the temperature fell altogether 12°, but part of the decrease was *before* the actual fall of the balls. They were tolerably regular in form, the usual pyramid with a cauliflower-like base, but were not so regularly striated as I have generally seen them; their temperature was 28°·5, they covered the ground about ·2 in. deep, and their density was about 5 times that of ordinary snow, and about a third that of water or ice. T was heard at 1.22, and L seen at 1.27 p.m.

A few flakes of snow at 8.30 a.m. on 10th.

During the last ten years snow or hail has fallen at Camden Town 37 times in March. On the 8th it has fallen 8 times, on the 9th 5 times, on no other day more than twice, and on 13 days it has never fallen.

I have tried to test by Mr. Glaisher's Quarterly Reports to the Registrar-General, 1853–65, the relative frequency of snow and hail on each day in March. The result is a marked excess on 8th, and 9th, but none is reported in 1853–54, or 1856. Secondly, I have taken out from Howard's "Climate of London," every day on which snow or hail occurred during the 25 years, 1806–30, and I find therefrom that hail fell oftener on March 13th, than on any other day in the year, and that snow was very frequent on March 6th, 7th, 10th, and 11th; more so, in fact, than on most days in January. Taking snow and hail together, they fell on 6th, 10th, 11th, and 13th, twice as often as the average of the month.

I wish to avoid anything like special pleading in favour of a periodicity I should have been foremost to criticise; I therefore leave the above facts to fight their own battle; it is certainly novel to hear a periodic hailstorm spoken of as coolly as a periodic display of shooting stars—but it must not be shelved because it is novel: it has occurred on the same date in every year since 1857, except 1861 and 62. that is to say, 8 years out of 10.

METEOR ON FEBRUARY 22ND, 1866.

From the Notes on the Month, it will be seen that this was seen at Sandwick 8.30 p.m., larger than the moon, moving from N.E. to S.W.; Ballater 8.45 p.m. It was also seen at Wick, Thurso, Keith, New Pitsligo, Crieff, and Aberdeen; also as far S. as Halifax. I append abridgments of three reports.

WICK.—*(John o'Groat's Journal.)*—"This evening a meteor of remarkable size and brilliancy passed from E. to W.; as it descended a cone of intensely luminous matter was distinctly visible in advance of the trail, when all at once it exploded into a shower of sparks and disappeared, the explosion sounded like a short, dull peal of thunder. The light was of a bluish tinge, threw strong shadows, lightened up dark rooms, scared horses, and frightened more than one traveller."

KING'S CROSS, HALIFAX, YORKSHIRE.—(Rev. J. Gledhill.)—About 8.15 p.m. saw a fine fire-ball in N., about 50° above horizon. Its path was an apparently horizontal line towards N.N.E., and extended at least 90° in that direction. Its motion and light were uniform; colour, silvery white; no trail, nor luminous haze. Larger than a 1st magnitude star.

MUTHILL, CRIEFF.—(Rev. A. J. T. Morris.)—At 8.45 p.m. a brilliant meteor suddenly appeared in the N.N.E., 50° above the horizon; it was dazzlingly bright, bluish white, and about a sixth the size of the moon; it hovered for a moment, then fell slowly about 12° slanting slightly to N. It then changed from spherical to oval, became red, and threw out a tail 5° long, but continued its course for 10° more, when it resumed its original colour and form and disappeared suddenly, without explosion or fracture, in due N., about 20° above the horizon. I believe disappearance arose solely from its passing behind a thick cloud.

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SYMONS'S
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EQUIVALENT EXPRESSIONS OF WIND FORCE.

THERE is probably no branch of Meteorology for which so many tables have been given, as for the conversion of the various wind scales into terms of one another. Having been frequently asked to epitomize and analyse them, I have lately done so with a most unsatisfactory result. I have found among the books on my own shelves at least a dozen tables, scarcely two of which are in exact accordance, while several have one or more numerical errors, and none agree in the names to be assigned to the various forces. For these reasons I have abandoned my original intention of placing them all in juxtaposition, and drawn up the following short table, which, it is hoped, will suffice for all ordinary purposes. I desire, however, in the first place, to lodge a protest against the possibility of obtaining any *simple* rule for the conversion of velocity into pressure, and *vice versa*; because the momentum of a body varies with its density: hence, if the barometer be at, say 28 inches, the pressure of any wind will be less than if the barometer were at 30 inches, the velocity in each case being the same, since each cubic foot of air would weigh about 36 grains more then, than at 28 inches.

It is a pity that two estimation scales (0—6 and 0—12) have been introduced; but it seems impossible to displace either, since each has its advantages: 0—12 is so generally used at sea, and has been so associated with the sails, &c., a ship can carry, that its displacement is undesirable; and the land scale 0—6 is very good, because, by squaring the numbers, we obtain directly the pressure in pounds per square foot. These, then, are the advantages of each, and seem such as to render it probable that Meteorologists will long have to endure the confusion arising from uncertainty as to which scale has been used.

RULES FOR CONVERSION IN CASES NOT GIVEN IN THE TABLES.

Lind's Gauge into pounds per square foot. — Multiply the height of water-column in inches by 5·2, and the result will be the equivalent pressure in lbs.; *e.g.*,—If Lind shews 3·8 inches, then 3·8 × 5·2 = 19·76lbs.

Lind's Gauge into miles per hour.— Proceed as before, and take the equivalent in miles from Table II.; *e.g.*—Lind 3·8 × 5·2 = 19·76lbs., which again (Table II.) equals a velocity of 63 miles per hour.

Velocity into pressure.—This is very undesirable; but the Rule most generally adopted is—Multiply the square of the velocity in miles per hour by ·005; *e.g.*—42 miles per hour—then 42 × 42 = 1764 × ·005 = 8·8lbs. per square foot.

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GENERAL CONVERSIONS.—TABLE I.

ESTIMATION.		INSTRUMENTAL.			POPULAR DESCRIPTION.
Beaufort, or Nautical Scale.	Land Scale.	Lind's Gauge.	Pressure per sq. foot.	Velocity, per hour.	
0—12	0—6	inches.	lbs.	miles.	
0	0	0	0	0	Calm.
1	·5	·05	·3	8	Gentle breeze.
2	1·0	·19	1·0	14	Moderate ,,
3	1·5	·43	2·3	21	Fresh ,,
4	2·0	·77	4·0	28	Very fresh.
5	2·5	1·20	6·3	35	Strong.
6	3·0	1·73	9·0	42	High wind.
7	3·5	2·36	12·3	50	Moderate gale.
8	4·0	3·08	16·0	57	Gale.
9	4·5	3·89	20·3	64	Fresh gale.
10	5·0	4·81	25·0	71	Strong ,,
11	5·5	5·82	30·3	78	Storm.
12	6·0	6·92	36·0	85	Hurricane.

PRESSURE CONVERTED INTO VELOCITY.—TABLE II.

Pressure	Velocity	Pressure	Velocity	Pressure	Velocity	Pressure	Velocity	Pressure	Velocity
lbs.	miles.	lbs.	miles.	lbs.	miles.	lbs.	miles.	lbs.	miles.
·1	4	4	28	16	57	28	75	40	89
·2	6	5	32	17	58	29	76	41	91
·3	8	6	35	18	60	30	77	42	92
·4	9	7	37	19	62	31	79	43	93
·5	10	8	40	20	63	32	80	44	94
·6	11	9	42	21	65	33	81	45	95
·7	12	10	45	22	66	34	82	46	96
·8	13	11	47	23	68	35	84	47	97
·9	13	12	49	24	69	36	85	48	98
1·0	14	13	51	25	71	37	86	49	99
2·0	20	14	53	26	72	38	87	50	100
3·0	24	15	55	27	73	39	88		

NOTE.—It should perhaps be mentioned that the above tables have been computed on the assumptions (1) that a cubic-foot of water weighs 62.4lbs: (2) that the square-root of 200 times the pressure equals the velocity. This value has been most generally adopted, and is near the average of all the best tables.

WELLS, THEIR TEMPERATURE AND DEPTH.

IT is by no means easy to foresee the branches of water measurement which will yield the *most* useful results, but it is impossible to deny that long and well kept records of the depth at which the water stands and has stood in bygone years would be of great use. Obviously they afford our best test of the condition of the ceaseless underground streams, and give us a better measure of the rainfall penetrating the earth's surface than any percolating gauge ever devised. Careful observations should teach us the rate and amount of percolation through the different geological formations, and would, in all likelihood, lead to many unexpected and useful results.

Again, so far as we are aware, no observations on the temperature of well water have been published except in Scotland, and there we find no record of the depth of the water below the surface, on which obviously the range of its temperature largely depends.

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Believing that these two points are worthy of careful watching, we submit the following *suggestions*, trusting that they may act as a basis on which explicit rules may be framed, and that they may be freely criticised.

(1.) *Depth of water.*—Probably the easiest plan will be to have tapes (like measuring tapes), with a small disc attached, which on reaching the water should both produce a ripple and a slight sound.

(2.) Should the well be *very* deep, and light deficient, a small hand-mirror would, perhaps, reflect sufficient light.

(3.) The most *convenient* mode of observing, and one that might readily be made self-recording, would be to have a float attached to a long iron rod, which would then rise and fall with the level of the water, and its height could be noted with the greatest ease.

(4.) The measurement must be from some permanent mark on the framework of the well, or other well-defined object. The height of this point above mean sea level should be ascertained if possible.

(5.) It should be measured at some *regular* time, as well as at such irregular ones as the observer may please; but the *regular* measurement should be when the well has been as little interfered with as possible. (*Query*, Would not every Monday morning be a good time?)

(6.) Until the plan is regularly arranged, observers should err by taking too many observations, and writing too copious remarks rather than otherwise.

(7.) *Temperature of the Water.*—Considerable care must be used in selecting a thermometer for this purpose, (should a sufficient number of observers desire it, special thermometers could *probably* be prepared for 10s. 6d. each), and with such, some interesting points might be cleared up. For example, the following table shows how closely the *mean* temp. of well water approaches the mean temperature of the air, though its *range* of temperature is infinitely less; hence the scale of a well-water thermometer must be rigorously correct between 35° and 55°, but need not probably pass those points. Every temperature record should state the depth from which the water is drawn, and the first should specify the geological formation.

(8.) The temperature should be ascertained by simply drawing a bucket of water, and stirring the thermometer in it until it ceases to vary. This is believed to be far preferable to lowering a thermometer into the water, as it is liable to change between leaving the water and reaching the observer. Where a pump is affixed, it is probable that after pumping a bucket or so, the water would have the true well temperature, and a thermometer held in the spout would show it correctly.

TEMPERATURE OF WELLS IN SCOTLAND, 1864.

	Sandwick.		Arbroath.		Barry.		Otter House		Smeaton.		E. Linton.		Thurston.		Cargen.	
	Air.	Well.	Air.	Well.	Air.	Well.	Air.	Well.	Air.	Well.	Air.	Well.	Air.	Well.	Air.	Well.
Jan. ...	38·5	46·0	37·6	47·0	36·3	44·7	36·5	45·7	35·6	45·4	37·0	48·0	35·0	46·4	36·0	47·8
Feb. ...	34·6	45·7	35·5	46·0	35·3	43·7	32·8	44·9	33·7	45·6	34·2	48·0	33·3	45·1	34·8	48·1
Mar....	37·0	44·7	39·2	46·5	38·6	42·0	37·0	44·8	38·3	45·0	40·4	48·0	37·4	45·5	39·4	47·9
April..	44·5	44·9	46·9	46·2	46·5	43·2	45·3	45·6	47·6	46·1	47·6	48·0	45·2	45·3	47·4	47·8
May ...	46·6	45·4	50·2	46·5	50·2	45·7	50·7	46·5	51·4	46·8	49·6	49·0	48·8	46·1	52·4	47·9
June...	51·2	45·7	56·0	47·0	55·0	46·4	53·2	47·7	55·4	47·8	55·0	48·0	52·9	45·5	54·8	48·0
July ...	54·2	46·6	58·1	47·7	57·1	48·2	56·4	48·6	58·0	47·6	57·6	49·0	54·9	45·9	60·3	48·0
Aug....	52·6	47·5	56·5	48·5	55·7	49·2	53·0	48·8	56·0	47·8	56·0	49·0	53·8	45·9	56·4	48·0
Sept...	52·0	47·1	54·0	48·5	53·8	49·2	51·3	48·0	53·6	47·6	54·3	49·0	52·0	46·0	54·2	48·0
Oct. ...	45·9	47·0	48·1	48·5	47·6	49·2	44·4	47·2	46·0	47·6	46·4	49·0	45·4	46·2	48·1	48·0
Nov. ..	43·4	46·4	42·2	48·0	41·4	47·8	39·6	46·3	40·6	48·0	41·7	49·5	40·5	45·4	42·0	48·1
Dec. ...	41·7	46·0	40·7	46·5	39·8	46·7	38·3	45·6	39·5	47·6	40·2	49·8	39·2	45·9	40·2	48·1
Mean..	45·0	46·1	47·1	47·2	46·4	46·3	44·9	46·6	46·3	46·9	46·7	48·7	44·9	45·8	47·2	48·0
Max..	54·2	47·5	58·1	48·5	57·1	49·2	56·4	48·8	58·0	48·0	57·6	49·8	54·9	46·4	60·3	48·1
Min....	34·6	44·7	35·5	46·0	35·3	42·0	32·8	44·8	33·7	45·0	34·2	48·0	33·3	45·1	34·8	47·8
Range.	19·6	2·8	22·6	2·5	21·8	7·2	23·6	4·0	24·3	3·0	23·4	1·8	21·6	1·3	25·5	·3

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RAINFALL IN MARCH, 1866.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground		Above Sea Level.	Depth of Rain. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which ·01 or more fell.
			ft.	in.	feet.	inches.	inches.	inches.		
I.	ENGLAND.	Camden Town	0	6	100	1·69	— ·39	·41	23	17
II.		Staplehurst (Linton Park)	0	6	200 ?	2·27	— ·22	·54	24	17
,,		Selborne (The Wakes)	4	0	500 ?	2·72	+ ·12	·79	23	12
III.		Hitchen	2	0	240	1·28	— ·89	·42	24	13
,,		Banbury	7	0	345	1·33	— ·88	·23	23	17
,,		Wisbech	0	6	10	·95	...	·19	17	13
IV.		Bury St. Edmunds (Culford)	1	2	...	1·30	— ·90	·26	17	11
V.		Calne	0	11	250	2·01	...	·51	23	13
,,		Plymouth (Goodamoor)	0	2	580	4·42	— ·74	·76	15	18
,,		Barnstaple	0	6	31	3·23	+ ·08	·61	23	15
,,		Taunton (Fulland's School)	1	4	...	3·44	...	1·16	24	10
VI.		Shrewsbury (Highfield)	5	6	200	1·42	— ·72	·31	13	11
,,		Tenbury (Orleton)	0	9	200	2·31	— ·11	·45	23	19
VII.		Leicester (Wigston)	0	6	220	1·27	— ·84	·24	17	15
,,		West Retford	0	6	50	1·22	— ·72	·27	6	17
,,		Derby	5	0	180	1·72	— ·53	·41	17	18
VIII.		Manchester	2	7	106	2·17	— ·46	·35	17	13
IX.		York	0	6	50	1·35	— ·64	·44	7	15
,,		Skipton (Arncliffe)	3	0	750	3·60	—1·21	·74	6	13
X.		North Shields	1	0	124	2·47	+ ·12	·53	6	22
,,		Borrowdale (Seathwaite)	1	0	422	13·05	— ·35	3·30	24	17
XI.	WALES.	Abercarn	1	3	450	3·84	...	·76	23	14
,,		Haverfordwest	2	0	60	5·39	+1·94	1·70	24	19
,,		Rhayader (Cefnfaes)	2	0	880	3·93	+ ·09	·61	17	17
,,		Llanberis (R. Victoria Hotel)	1	0	370	5·91	...	1·83	23	14
XII.		Dumfries	0	5	70	2·03	— ·95	·51	28	13
,,		Hawick (Silverbut Hall)	4	0	512	1·93	...	·28	26	18
XIV.		Ayr (Auchendrane House)	2	3	94	2·13	—1·60	·44	23	14
XV.		Otter House	0	6	130	4·43	— ·21	1·03	24	16
,,		Fort William	0	8	20	3·68	...	1·01	29	18
XVI.	SCOTLAND.	Leven (Nookton)	0	6	80	2·02	— ·05	·67	6	18
,,		Stirling (Deanston)	0	0	130	2·75	— ·78	·50	23	20
,,		Logierait	1	0	250	4·31	...	1·12	23	16
XVII.		Ballater	0	10	656	7·04	...	1·50	6	18
,,		Aberdeen	4	8	115	3·21	...	·71	6	20
XVIII		Inverness (Culloden)	3	0	104	...	...	...	...	...
,,		Portree	0	4	60	6·40	—2·64	1·24	5	21
,,		Loch Broom	0	8	48	3·73	...	·51	29	27
XIX.		Helmsdale	1	0	34	2·13	...	·23	12	22
,,		Sandwick	2	0	78	3·08	— ·25	·33	30	23
XX.		Cork	6	0	65	3·98	...	1·29	14	18
,,		Waterford	4	0	60	3·51	+ ·62	·72	14	18
,,		Killaloe	5	0	128	3·85	— ·47	·98	23	22
XXI.		Portarlington	9	0	236	2·92	— ·39	·85	23	24
,,		Monkstown	0	6	100	4·15	+1·57	1·17	23	19
XXII.	IRELAND.	Galway	6	0	25	3·29	...	·50	14	25
,,		Bunninadden (Doo Castle)	1	0	...	2·93	...	·59	23	23
XXIII		Bawnboy (Owendoon)	1	3	218 ?	3·29	...	·68	23	22
,,		Waringstown	0	4	191	3·08	...	·65	23	21
,,		Strabane (Leckpatrick)	0	5	260	2·64	...	·52	23	25

+ Shows that the fall was above the average ; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

[ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; and T S for Thunderstorm.]

ENGLAND.

CAMDEN TOWN.—Snow on 1st, 8th, 10th, 13th, and 22nd, but in very small quantities, except on 8th (for description see "Meteorological Magazine," No. 2, page 18.) The 15th was remarkable for the extreme dryness of the air; lunar halo on 27th. Max. 65°·2 on 29th, in sun 106°·2 on 30th; Min. 22°·5 on 1st, and on grass 14°·2 on the same day.

LINTON PARK.—Less wind than usual, except on 23rd, when we had a gale at night, blowing down several trees. Snow on 7th, 8th, 13th, and 21st. Max. 65° on 29th; min. 22° on 1st.

SELBORNE.—Snow on 1st, 4th, 5th, 15th, 21st; hail on 9th, at 5 p.m., also on 24th. Aurora on 6th, 9th, 16th, 19th. Max. 57° on 29th; min 17°·5 on 1st.

WISBECH.—Dull showery month; gale 15½ lbs. on 23rd at 9 p.m.; snow on 13th at 7 p.m.; hail on 7th, and at noon on 21st. Aurora on 18th, at 10 p.m. Solar halos on 18th and 23rd. Max. bar. 30·418 on 10th; min. 29·024 on 24th. Max. temp. 63°·5 on 29th; min 21°·1 on 1st.

CULFORD.—Rather less wind than is usual in March, except that on the night of the 22nd (23rd ?) when it blew quite a hurricane, unroofing buildings, and blowing down chimneys. Max. 61° on 29th; min. 23° on 1st.

GOODAMOOR.—Frost on 18 mornings; tremendous gale all the afternoon of 23rd from S.E. through S. to W. and N.W., with much rain; snow on 1st, 7th, 8th, & 13th.

BARNSTAPLE.—Max. bar. 30·42; min. 28·97 in. Max. temp. 60°·5 on 27th; min. 19°·0 on 1st.

ORLETON.—Generally cloudy, dull, and cold; snow at 6 p.m. on 4th, also on 5th, 6th, 13th, 15th, 21st. On 18th, distant T in S. and W. Violent wind and rain on 23rd.

WIGSTON.—Mean temp. below the average; the rainfall was also below it, although the month was damp throughout. Very stormy on 23rd, especially at night.

WEST RETFORD.—A dull, cold month, with occasional snow showers. High wind on 23rd; bar. 28·77. Frost on 18 nights. Min. 15° on 1st; max. 65° on 29th.

DERBY.—No high winds; wet, cheerless, and unfit for gardening operations.

MANCHESTER.—With the exception of the last week, the mean temp. was generally below the average.

YORK.—Snow on 4th, 6th, 13th, and 22nd.

ARNCLIFFE.—Early part of month very cold, latter part very wet; heavy snow on 22nd. Min. 16° on 5th, 18° on 1st, and 20° on 7th.

N. SHIELDS.—Barometer and thermometer low throughout; snow on 12 days; hail on 21st and 22nd; lunar halo, 27th.

SEATHWAITE.—Early part of the month dry and frosty, with strong E. winds; last 10 days very wet and stormy, with variable winds. Rain over an inch on 5 days, over two inches on 2 days, viz., 27th = 2·48, and 24th = 3·30 in.

WALES.

ABERCARN.—A dry, cold month on the whole, and generally calm, excepting a heavy storm on 23rd; snow on 8 days.

HAVERFORDWEST.—March came in like a lion; snow and severe frost; thermometer as low as 18°·5 at sunrise on 1st; weather cold and gloomy, with snow every night until 13th, afterwards milder (though still very wintry) and much wetter, and at times very stormy, especially about 15th and 16th, and 23rd and 24th; the latter being the most severe storm this year. Rainfall above the average, temperature below it. The land so wet that farming operations are much retarded.

CEFNFAES.—Snow on 6th, 13th, 14th and 31st; T on 18th; S.E. gale on 23rd. Last three days very mild and spring-like, vegetation coming rapidly forward.

SCOTLAND.

DUMFRIES.—March opened with the rigour of winter; on morning of 5th, temp. down to 19°, the lowest point during the winter; after 10th the frost broke. Snow on 1st, 4th, 6th, (five or six inches deep), 13th, 15th, 20th, and 23rd. Close of month mild and showery, vegetation progressing, but snow still on the hills.

HAWICK.—Snow and frost all the first fortnight; T in afternoon of 12th.

AUCHENDRANE.—A cold dry month; grass min. below freezing on 23 nights. Max. 57° on 30th, min. 18° on 2nd. Max. barometer 30·531 on 10th; min. 28·756

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on 24th. Heavy gale from S. on 23rd, but of short continuance, and not so severe as in the south of England.

OTTER HOUSE.—Although there was frost on 18 nights there was none in the day; the temperature gradually increased during the month. Daffodils are in full bloom, and the poplar nearly in leaf. [Now, April 10th, ten days after the date of the above report, more than 300 miles south of Otter House, and within the warming influence of the metropolis, no poplars yet show even leaf buds, thus showing how mild a winter residence is afforded by the Western Isles of Scotland.—ED.]

FORT WILLIAM.—Snow on 6th and 22nd. Prevailing wind N.E. until 26th, afterwards S. and S.W.

NOOKTON.—Weather variable; snow and night frosts alternating with mild spring-like weather. Min. temp. 21° on 5th; max. 58° on 29th. Snow on 1st, 6th, 7th, and 8th (with hail), daily from 19th to 23rd. Breeze at 8 p.m. on 23rd.

DEANSTON.—Snow or hail on nine days; frequent frosts; Max. 55°·9 on 29th; min. 12°·5 on 22nd.

LOGIERAIT.—A very stormy month—much snow and hard frosts till within the last week. In the last few days spring flowers and early budding trees have made much progress, but agricultural work is very far behind.

BALLATER.—A very stormy month, the fall of snow (averaging 2ft. 6in. on 7th), being greater than for at least a dozen years, while the temperature, on several occasions, was very low, falling on 5th to 3°·5, (28°·5 below freezing). There were strong N.E. gales on 3rd and 12th. During the last week the weather became much milder, and the snow melting on the hills caused the streams in the neighbourhood to be much flooded.

ABERDEEN.—More or less snow, sleet, or hail on twelve days; but on no day did the fall exceed three-quarters of an inch. Max. 60° (in sun 107°·9) on 28th. Min. 18°·5 (on grass 9°) on 5th. Max. bar. 30·363 on 10th; min. 28·909 on 24th. Aurora on thirteen nights—no severe gale.

PORTREE.—A cold wet month: agricultural operations very backward, the ground being soaked with water. No cattle disease in the island. Snow on nine days. Solar halo on 25th, at 6 p.m.—Lunar halos on 20th, 25th, and 28th. Max. temp. 54° on 28th; min. 18°·9 on 5th; on grass 15°.

LOCHBROOM.—Nothing could exceed the changeableness of the past month, but frost and snow have been its prevailing characteristics.

SANDWICK.—Wet cold month; in fact, while the previous months this winter were uncommonly mild, February and March have been severe, vegetation and agricultural operations are therefore backward. Alternate snow and thaw several days. Snow two inches deep on 19th. Aurora on 7th and 8th; lunar halo on 25th, at 10.30 p.m. Max. 54°·2; min. 25°.

IRELAND.

KILLALOE.—A cold month, ground so wet as to delay sowing oats and planting potatoes; snow on 6 days; storm from S on night of 22nd, and all day on 23rd; violent wind and rain at 6 p.m. Barometer 28·28 inches.

PORTARLINGTON.—A very severe month.

GALWAY.—Aurora on 18th.

DOO CASTLE.—Although the quantity of rain this month is less than might be expected from the number of "days," yet the land being so thoroughly saturated by the three previous months' wet, without any lengthened interval of drying, its effects are those of a very wet month; farming operations are very backward.

OWENDOON.—A very severe month, with frequent piercing winds; spring work much retarded. Great storm on 23rd; T on 26th.

WARINGSTOWN.—Earlier part of month cold and wintry; latter part so broken as seriously to impede farming operations, which are consequently very backward. Frost on grass on 20 nights. On the night of 1st, the grass thermometer fell to 12°, much lower than on any other occasion this season. Heavy gale on evening of 23rd.

LECKPATRICK.—Cold month; the great rainfall at times rendering the soil too wet for sowing. Great fall of the barometer from 9 a.m. 22nd to 10 p.m. on 23rd, during which 37 hours it fell 1·3 inch. Gale from S.W. veering to N.E. Thermometers out of order; the porcelain scales had only been fastened with plaster of Paris, and became detached by the frost.

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Latitude and Longitude of the 50 Stations whence monthly returns are published.

Stations.	Latitude.	Longitude.	Stations.	Latitude.	Longitude.
Camden Town ...	51°33′ N	0° 8′ W	Dumfries	55° 5′ N	3°36′ W
Linton Park.....	51 13 N	0 31 E	Hawick	55 26 N	2 46 W
Selborne	51 6 N	0 56 W	Auchendrane Ho	55 27 N	4 37 W
Hitchen	51 57 N	0 17 W	Otter House ...	56 1 N	5 20 W
Banbury	52 4 N	1 20 W	Fort William ...	56 47 N	5 7 W
Wisbech	52 40 N	0 10 E	Nookton	56 12 N	3 0 W
Culford	52 17 N	0 42 E	Deanston	56 11 N	4 4 W
Calne.....	51 27 N	1 59 W	Logierait	56 38 N	3 41 W
Goodamoor	50 25 N	4 0 W	Ballater	57 4 N	3 5 W
Barnstaple	51 4 N	4 4 W	Aberdeen	57 9 N	2 6 W
Taunton	51 1 N	3 6 W	Culloden	57 30 N	4 7 W
Shrewsbury	52 42 N	2 46 W	Portree	57 24 N	6 13 W
Orleton	52 18 N	2 27 W	Loch Broom ...	57 47 N	5 5 W
Wigston	52 35 N	1 6 W	Helmsdale	58 7 N	3 38 W
W. Retford	53 19 N	0 58 W	Sandwick	59 3 N	3 17 W
Derby	52 55 N	1 28 W	Cork	51 54 N	8 30 W
Manchester	53 28 N	2 17 W	Waterford	52 16 N	7 6 W
York	53 58 N	1 5 W	Killaloe	52 48 N	8 26 W
Arncliffe	54 9 N	2 6 W	Portarlington ...	53 10 N	7 10 W
N. Shields	55 0 N	1 26 W	Monkstown ...	53 17 N	6 8 W
Seathwaite	54 30 N	3 12 W	Galway	53 17 N	9 3 W
Abercarn	51 39 N	3 6 W	Doo Castle	54 3 N	8 38 W
Haverfordwest ...	51 48 N	4 55 W	Owendoon	54 6 N	7 44 W
Cefnfaes.....	52 18 N	3 32 W	Waringstown ...	54 26 N	6 18 W
Llanberis	53 6 N	4 7 W	Leckpatrick ...	54 53 N	7 26 W

NOTE.—The above table has been compiled to facilitate the ready identification of the Stations, not with any pretension to rigorous accuracy; though it is hoped few of the positions are more than a mile or two in error, it is probable that some are, since few maps agree closely in the position of remote parts of the British Isles.

ON FIXING RAIN GAUGES.

HAVING noticed that the returns from one station were below all around it, I requested one of the observers in the neighbourhood to call and consult with the offending registrar as to the cause. He reported it a good gauge, but merely stuck in the hole of an old tree so loosely that any strong wind would blow it out of the perpendicular; in fact it was 15° or 20° out, when visited. The report continues :—

I fancy there may be more of your correspondents than you are aware of, who are unconscious of the absolute necessity of keeping their gauges perfectly *level* and *steady*, in order to obtain a correct account. Nor, I fancy, are they aware of the nicety required in measuring the rain in the graduated glass. For few are able to hold it perpendicular, and unless one does so I find that the difference of a hundredth at least may easily be occasioned. Then, again, an error may easily be made through not calculating by the proper surface of the water; for, owing to the attraction of the glass, the edge of the water is always nearly a hundredth higher than the centre, which is the *true level*; accordingly, in the use of the same gauge, one person may, in every registration, make the amount so much more or less than another, and no uniformity is arrived at. I find upon experiment that in Casella's gauges the calculations are made by the centre of the surface and not the edge—at least so it is in my glass measurer, and probably in all. If so, it would be well that all who use that gauge should calculate by the same rule.

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RECENT PUBLICATIONS.

Meteorological Diagram, showing the daily elements throughout the year 1865. By C. O. F. Cator, M.A. London: Stanford.

We gladly welcome this splendid lithograph, and rejoice that Mr. Cator has produced a better diagram for 1865 than he did for 1864, since to the previous copious details he has added the weekly price of wheat; true, this is affected by other causes as well as atmospheric fluctuations, yet none could look at this diagram without noting instantly how the rain in August sent the price up, and how rapidly it fell under the influence of the brilliant September of 1865. The mutual relations of temperature, pressure, wind, rain, mortality, &c., are most clearly shown, and we part with this handsome sheet with the suggestion that rather more prominence should be given to the barometer, and with the hope that Mr. Cator may delineate with equal accuracy the meteorology of many years to come.

A Treatise on Meteorology: the Barometer, Thermometer, Hygrometer, Rain Gauge and Ozonometer, with rules and regulations to be observed for their correct use. By Albert J. T. Morris. Edinburgh: R. Grant and Sons.

Mr. Morris describes his treatise as "specially adapted for the use of amateurs," and we envy those who learn their first lessons in Meteorology from his pleasantly-written pages, which are replete with information. We regret that Mr. Morris has adopted the *approximate* rule for barometer corrections given by Admiral FitzRoy in his daily Weather Reports, because we do not think observers would have found it more trouble to use a regular table, and thereby ensure correctness, and on one or two other points we should have liked stricter rules laid down; still we have not yet seen any treatise on Meteorology so suitable for an amateur observer as Mr. Morris's.

Annual Report of the Royal National Lifeboat Institution. Published at the Office, John Street, Adelphi.

Though not strictly Meteorological, the publications of this Society (especially their quarterly journal, "The Lifeboat") so frequently contain communications on Meteorology that that reason is superadded to the universal desire of helping forward their noble work in inducing us to wish them all success. It is very gratifying to see that though their expenses last year were nearly £30,000, their receipts were even larger: long may the balance continue on that side; but that such may be the case *all* must remember (what treasurers of societies never forget) that an ample supply of new subscribers must be enlisted each year to take the place of those annually removed by death.

Proceedings of Literary and Philosophical Society of Manchester, Vol. 5, *No.* 12, contains a most interesting analysis by Mr. Baxendell of the first 8 months' records of Rev. J. C. Bates's quarter-hourly self-registering rain-gauge. Owing to the short period during which the instrument has been at work, there is little doubt that the results will require subsequent modification; but with this introductory remark, and looking to the interest attending this first determination of the relative rainfall in different hours of the day, we annex with pleasure the results Mr. Baxendell has deduced:—

Daily Rainfall.		Oscillations of Magnetic Needle.*
Principal maximum at	8½ a.m.	10 a.m.
Secondary ,,	8 p.m.	7½ p.m.
Principal minimum	2 p.m.	1 p.m.
Secondary ,,	1½ a.m.	3 a.m.

* Mean of ten years' declination at Greenwich, westerly deviation being taken with a negative sign.

In addition to the similarity in the daily curves of rainfall and magnetic oscillations noted above, we may mention, as Mr. Baxendell has done, the similarity which the former presents to the barometric curve, save that the rainfall max. and min. precede the barometric by about two hours.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

IV.] MAY, 1866. [PRICE FOURPENCE, or 5s. per ann. post free

WELLS, VARIATIONS IN THEIR DEPTH.

WE are very glad to receive in speedy response to the article in last month's Magazine two very complete sets of well measurements. Some of the prominent features we purpose to notice on the present occasion, and, to make our remarks still more clear, have laid the results down on the accompanying diagram. In the first place, it should be stated that for the Hartlip observations we are indebted to Mr. Bland, of New Place, and for those from Chilgrove, to Mr. Leyland Woods.

The first feature that demands attention is the excessive fluctuation in the depth at Chilgrove as compared with that at Hartlip; that at the former being *nine times as great* as that at Hartlip.

The month of least water at Chilgrove is September, at Hartlip it is December; and a still stronger contrast exists with reference to the month of fullest supply, which is November at Chilgrove, and June at Hartlip, the probable, if we may not say evident, cause, being the rapidity with which the chalk downs absorb the rain falling on them. Indications of this may be noted in almost every year of the Chilgrove observations, but the most striking illustration occurred at the close of the summer drought of 1865. This, it will be remembered, ended on October 8th; rain fell most heavily from the 19th to the end of the month, amounting altogether to 10 inches, or 2 inches more than in any other month in the 13 years. The well on October 8th contained less than 19 feet of water, on 26th it had 24 feet, on November 2nd 66 feet, and by the end of that month 105 feet. A moment's glance at the Hartlip curve will show that no such fluctuations occur there.

It has, we believe, been laid down that summer rains are of little moment to the hydraulic engineer; it does not become us lightly to controvert the dicta of practical men, yet some points do appear worth mentioning. And, first, Chilgrove; the rainfall in the winter 1855-56, and the winter of 1861-62, were nearly equal, the summer of the former year had about 19 inches, and the latter 15. At the commencement of the summer half 1856 the well had 54 feet, and at its close 30 feet—*decrease* 24 feet; in 1862 it started with 82 feet, and had only 30 feet left, the *decrease* being 52 feet, or twice as great as with the wetter summer of 1856. Again, the winter of 1852-53 was considerably wetter than the winter of 1859-60, but the summers were the reverse. The *very* wet winter 1852-3, and wet summer of 1853 did not produce so much water by one-seventh as the wet winter 1859-60, and *very* wet summer of 1860. At Hartlip there seems even a stronger proof that summer falls are not to be ignored. The winters of 1828-29

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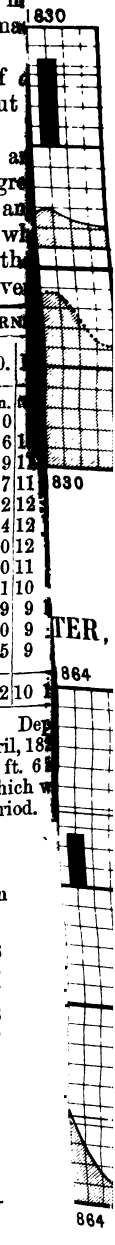
and 1829-30 were remarkably dry, and the summers as noticeably w
—but as is immediately seen from the diagram, the loss of nearly h
the usual winter supply was insensible, being, we suppose, fully ma
up by summer falls, and the well was rather fuller than usual.

Of course, we by no means ignore the normal dependence of
sources of water-supply on the rainfall of the colder months, but
appears that the summer rain must also be carefully watched.
occurs to us—and we give the suggestion for what it is worth, a
no more—that possibly the elevation of water (even from gre
depths) by natural capillary action may far exceed in amount an
thing of which we have any idea; if so, then we at once see wh
wet summers are so beneficial to the supply of well-water, for th
not only add a little to the winter's stores, but also preve



DEPTH OF WATER IN WELL AT NEW PLACE, HARTLIP, SITTINGBOURN

YEAR.	1819.		1820.		1821.		1822.		1823.		1824.		1825.		1826.		1827.		1828.		1829.		1830.	
	ft.	in.	ft.	in.	ft.	in.	ft.	in	ft.	in.	ft.	in	ft.	in	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
Jan. ...	10	0	6	7	6	3	6	10	7	3	7	0	17	3	10	6	9	6	8	4	9	8	13	10
Feb. ...	9	9	8	0	7	6	9	1	7	10	7	6	19	0	11	0	9	10	11	7	9	4	14	6
March	10	0	9	6	8	3	9	11	9	5	8	3	20	0	11	3	10	1	13	4	9	1	15	9
April .	10	9	9	6	8	9	10	1	10	9	9	0	20	4	11	6	11	0	14	3	9	3	16	7
May ...	10	9	9	0	9	0	10	2	11	9	10	0	20	0	11	6	11	3	14	6	9	6	17	2
June...	10	6	8	10	9	6	10	0	12	0	12	2	19	6	11	4	11	2	14	6	10	7	17	4
July ...	10	0	8	3	9	3	9	9	12	0	14	0	18	0	10	9	10	6	14	2	10	10	16	10
Aug....	9	6	7	4	8	6	8	8	11	9	13	6	16	6	9	10	9	8	13	7	10	9	16	0
Sept...	8	6	7	0	7	10	7	10	10	9	13	0	15	8	8	10	8	8	12	7	10	4	14	11
Oct. ...	8	0	6	6	6	10	7	3	10	0	12	6	14	0	7	9	8	1	12	0	10	10	13	9
Nov....	7	0	5	10	6	3	6	10	8	9	13	0	13	0	7	9	7	6	11	0	12	3	12	10
Dec....	6	6	5	10	5	10	6	6	8	0	14	3	11	6	8	2	7	5	10	2	13	2	12	5
MEAN.	9	3	7	8	7	10	8	7	10	1	11	2	17	1	10	0	9	7	12	6	10	6	15	2

Brim 157 feet 9 inches above sea; well sunk through plastic clay and chalk. Dep
to water, 130 ft.; mean depth of water, 10 ft 10 in.; greatest observed depth in April, 18
20 ft. 4 in.; least (in November and December, 1820), 5 ft. 10 in.; variation, 14 ft. 6
Recent measurements give for the minimum, 1 ft. in January, 1860, during which w
year it rose to 11 ft. 6 in. by October, or 1 foot above the average of the above period.

RAINFALL AT GREENWICH OBSERVATORY. Height above Ground, 6in.
Above Mean Sea Level, 155ft.

YEAR	1819	1820	1821	1822	1823	1824	1825	1826	1827	1828	1829	1830	Mean
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Jan. ...	2·3	1·9	2·4	·6	1·5	1·0	1·1	·3	1·2	4·3	·4	1·7	1·56
Feb. ...	3·0	·6	·0	1·1	3·5	2·5	1·0	1·9	·7	1·1	1·3	2·5	1·60
March.	1·8	1·5	3·9	1·5	1·5	1·9	1·4	1·9	2·6	1·0	·7	·3	1·67
April..	3·1	1·6	2·0	2·9	2·0	2·1	2·0	1·1	1·3	2·4	4·8	3·2	2·38
May ...	3·3	4·0	2·4	2·1	·8	4·2	3·3	2·7	2·6	1·7	·6	2·2	2·49
June...	2·5	2·3	2·4	·9	1·2	3·8	·8	1·1	·7	2·2	1·7	2·6	1·85
July ...	2·2	4·8	3·1	4·5	3·6	2·0	·1	2·6	1·4	7·0	4·2	1·9	3·12
Aug....	·4	1·9	2·1	2·0	3·0	4·4	2·7	1·9	1·2	4·2	4·5	3·9	2·68
Sept...	3·4	2·4	3·7	1·5	1·0	3·5	2·8	3·4	3·9	2·6	3·6	3·5	2·94
Oct. ...	2·3	2·9	2·6	4·0	4·4	2·6	3·0	1·9	4·4	1·5	1·9	·8	2·69
Nov....	3·0	2·0	4·7	4·1	1·8	4·3	3·2	2·8	1·3	1·0	1·4	3·4	2·75
Dec. ...	3·8	1·8	5·2	2·5	2·8	4·0	3·2	1·4	3·6	2·5	·1	1·2	2·67
TOTAL	31·1	27·7	34·5	27·7	27·1	36·3	24·6	23·0	24·9	31·5	25·2	27·2	28·40

total

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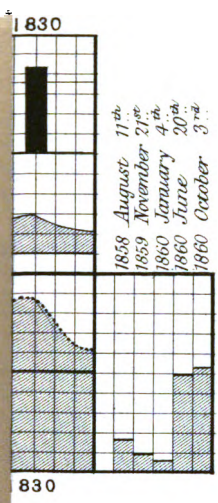
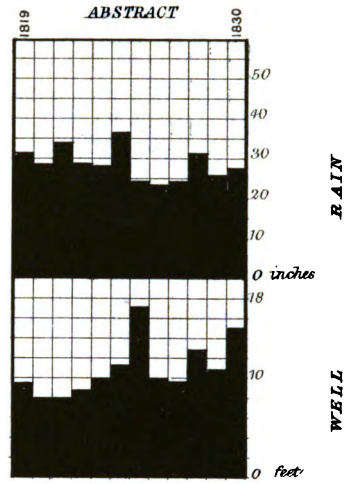
NGBOURNE, KENT.





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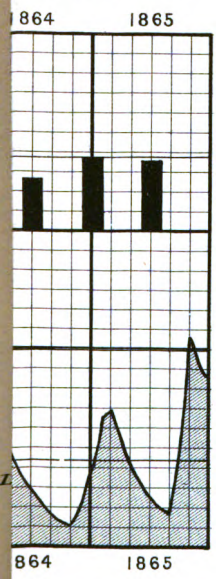

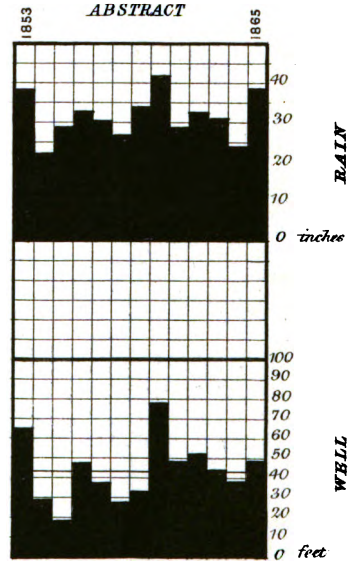

total fall during the six summer and six winter months,

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the constant drain of evaporation from the surface of the ground; and, if our theory be worth anything, not *only* from the surface but also from the uniformly moist ground beneath, down, we know not how far.

It will be seen that the depth of water at Hartlip is shown twice, once on the same scale as that at Chilgrove, for comparison therewith, and once on a more open scale, to show the monthly variations. The isolated observations in 1858-59-60 are very interesting, as showing how slight (if any) is the permanent lowering of the water at that place.

The abstracts are mainly interesting as indicating that, from our rainfall observations when fully analyzed, we may hope to determine the amount of water stored in the earth at any date for nearly 200 years, and even the level at which it would stand.

DEPTH OF WATER IN WELL AT CHILGROVE, CHICHESTER.

Well situated in a valley of the Chalk Hills—brim about 266 feet above Sea Level, the hills on three sides rise from 200 to 500 feet above it.

YEAR.	1853	1854	1855	1856	1857	1858	1859	1860	1861	1862	1863	1864	1865	Mean 13 yr.
	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
Jan. ...	135	65	×	76	71	38	11	107	93	57	95	59	32	65
Feb. ...	80	60	×	75	59	39	36	91	65	61	81	62	67	60
March.	60	48	11	56	51	40	36	60	66	96	59	90	69	57
April	50	38	15	54	47	40	35	53	66	82	43	59	50	49
May ...	52	30	18	44	40	35	35	50	50	60	33	46	38	41
June...	43	24	18	41	32	31	36	83	37	48	30	35	31	38
July ...	40	18	16	39	26	25	25	64	29	38	27	30	25	31
Aug. ..	40	15	13	31	21	21	20	65	24	31	23	23	20	27
Sept. ..	49	14	11	26	17	17	15	65	21	25	19	16	19	24
Oct. ...	98	13	19	30	25	13	14	84	18	30	23	14	45	33
Nov....	84	×	44	31	33	11	38	85	40	42	37	12	105	78
Dec. ...	54	×	39	62	38	10	76	100	70	65	59	16	91	53
Mean..	65	28	18	47	38	27	31	76	48	53	44	39	49	43

NOTE.—Previous to February, 1855, the well was only 135 ft. deep, subsequently it was 145 ft., the 10 ft. has been added to the first two years' measurements, so as to secure uniformity; there was no water at 135 ft. in the four months × × × ×, but it probably was considerably above the base line of 145 ft. In taking the means 8 ft. has been assumed for each of those months. Mean depth of water 43 ft., greatest observed depth (in Jan., 1853) 135 ft., least (in the winter of 1855) 8 ft ? variation 127 ft. In Jan., 1866, it rose to 143 ft., which would raise the variation to 135 ft.

RAINFALL AT CHILGROVE. Height above Ground, 6in. Above Mean Sea Level, 284 ft.

YEAR.	1853	1854	1855	1856	1857	1858	1859	1860	1861	1862	1863	1864	1865	Mean
Jan. ...	5·00	3·17	·70	4·05	2·98	1·65	2·44	4·34	·78	3·21	3·95	2·06	4·35	2·98
Feb. ...	1·10	·80	1·50	1·35	·43	1·03	2·21	1·50	2·08	·75	·94	1·48	2·60	1·37
March.	2·07	·42	2·95	1·25	2·20	1·66	1·88	2·18	2·96	3·99	1·21	3·39	1·26	2·11
April .	3·45	·16	·45	3·86	2·11	2·67	3·27	1·75	·76	1·13	·57	1·48	·43	1·70
May ...	2·25	3·92	2·95	3·83	1·35	2·40	1·23	3·85	1·55	3·55	2·35	1·60	2·89	2·59
June ..	2·49	1·90	1·30	2·21	2·30	·99	1·30	6·72	2·34	2·60	4·52	1·33	2·27	2·48
July ...	6·47	·85	4·50	·79	1·51	2·95	3·08	2·88	4·81	2·74	·89	·38	2·44	2·64
Aug....	3·46	1·35	1·32	4·29	2·42	2·57	1·74	5·05	·73	2·39	1·99	1·04	5·49	2·60
Sept....	3·61	1·20	2·70	4·20	4·72	2·56	4·35	3·86	3·94	2·24	4·20	4·26	·30	3·24
Oct. ...	5·97	4·02	7·20	3·22	7·83	2·20	4·15	2·86	1·81	5·17	4·33	1·88	9·95	4·66
Nov...	1·60	1·85	1·70	1·04	2·08	1·75	5·04	3·60	4·99	1·45	2·24	4·35	3·50	2·70
Dec. ...	·65	2·17	1·69	2·88	1·31	3·43	3·57	3·41	1·92	3·13	3·26	1·42	2·97	2·45
TOTAL.	38·12	21·81	28·96	32·97	31·24	25·86	34·26	42·00	28·67	32·35	30·45	24·67	38·45	31·52

RAINFALL IN APRIL, 1866.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground	Above Sea Level.	Depth of Rain. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which ·01 or more fell.
		ft. in.	feet.	inches.	inches.	inches.		
I.	ENGLAND. Camden Town	0 6	100	1·76	+ ·63	·74	28	13
II.	Staplehurst (Linton Park)	0 6	200 ?	2·09	+ ·87	·53	29	16
,,	Selborne (The Wakes)	4 0	500 ?	2·78	+1·28	·49	28	15
III.	Hitchen	2 0	240	1·65	+ ·65	·76	29	14
,,	Banbury	7 0	345	1·52	+ ·36	·75	28	14
,,	Wisbech	0 6	10	1·69	...	·57	28	9
IV.	Bury St. Edmunds (Culford)	1 2	...	1·85	+1·10	·46	28	12
V.	Calne	0 11	250	2·17	...	·67	28	19
,,	Plymouth (Goodamoor)	0 2	580	2·98	+ ·73	·56	11	15
,,	Barnstaple	0 6	31	1·46	— ·55	·35	12	13
,,	Taunton (Fulland's School)	1 4	...	1·91	+ ·37	·53	29	13
VI.	Shrewsbury (Highfield)	5 6	200	·68	— ·66	·24	12	9
,,	Tenbury (Orleton)	0 9	200	1·69	+ ·15	·35	12	18
VII.	Leicester (Wigston)	0 6	220	1·31	+ ·01	·25	6	13
,,	West Retford	0 6	50	1·27	+ ·26	·27	2	13
,,	Derby	5 0	180	1·04	— ·39	·43	1	14
VIII.	Manchester	2 7	106	·30	—1·46	·08	20 & 27	6
IX.	York	0 6	50	1·05	— ·05	·33	3	11
,,	Skipton (Arncliffe)	3 0	750	2·01	—1·03	·43	1	12
X.	North Shields	1 0	124	1·47	+ ·16	·31	1	13
,,	Borrowdale (Seathwaite)	1 0	422	5·97	— ·93	1·18	16	15
XI.	WALES. Abercarn	1 3	450	3·30	...	·84	28	17
,,	Haverfordwest	2 0	60	2·21	+ ·35	·64	28	10
,,	Rhayader (Cefnfaes)	2 0	880	1·33	+ ·56	·30	28	15
,,	Llanberis (R. Victoria Hotel)	1 0	370	5·42	...	2·92	2	13
XII.	SCOTLAND. Dumfries	0 5	70	·96	— ·71	·21	19	12
,,	Hawick (Silverbut Hall)	4 0	512	2·22	...	·54	2	17
XIV.	Ayr (Auchendrane House)	2 3	94	·77	—1·46	·22	15	10
XV.	Otter House	0 6	130	2·30	— ·45	·55	20	11
XVI.	Leven (Nookton)	0 6	80	1·45	+ ·20	·34	19	13
,,	Stirling (Deanston)	0 0	130	2·11	+ ·36	·86	16	14
,,	Logierait	1 0	250	1·49	...	·34	16	11
XVII.	Ballater	0 10	656	2·06	...	·48	1	18
,,	Aberdeen	4 8	115	1·62	...	·63	19	16
XVIII	Inverness (Culloden)	3 0	104	1·01	...	.41	2	9
,,	Fort William	0 8	20	3·79	...	1·32	16	14
,,	Portree	0 4	60	3·80	—1·47	1·02	19	12
,,	Loch Broom	0 8	48	2·59	...	·40	1	16
XIX.	Helmsdale	1 0	34	1·49	...	·46	28	19
,,	Sandwick	2 0	78	1·21	— ·53	·38	20	13
XX.	IRELAND. Cork	6 0	65	3·62	...	1·19	26	21
,,	Waterford	4 0	60	2·41	+ ·18	·54	26	19
,,	Killaloe	5 0	128	2·05	— ·08	·40	13	16
XXI.	Portarlington	9 0	236	1·64	— ·38	·31	5	20
,,	Monkstown	0 6	100	2·11	+ ·47	·52	4	17
XXII.	Galway	6 0	25	2·22	...	·46	15	18
,,	Bunninadden (Doo Castle)	1 0	...	1·65	...	·29	18	15
XXIII	Bawnboy (Owendoon)	1 3	218 ?	2·24	...	·36	18	20
,,	Waringstown	0 4	191	·98	...	·16	11	13
,,	Strabane (Leckpatrick)	0 5	260	1·26	...	·33	18	14

+ Shows that the fall was above the average ; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; and T S for Thunderstorm.]

ENGLAND.

CAMDEN TOWN.—Hail at 0.20 p.m. on 14th; lunar halo on 27th; currant in blossom on 19th; cherry on 25th; chesnut in leaf on 23rd; vine on 24th; first butterfly on 25th. Max. 79°·4; in sun, 120°·3 on 27th; min. 33°·8 on 30th.

LINTON PARK.—First fortnight wet; the latter fine, with the exception of the 29th. The whole month mild, there being frost only on two mornings, while on the 27th the thermometer was 80° in shade. L on 7th, 10th, 11th, and 14th. Vegetation advanced rapidly between the 20th and 29th, but the ground very cold and bad for tillage. Cuckoo heard on the 11th; some say one day sooner, which is earlier than usual.

SELBORNE.—Rapid change of temp. from 26th to 30th. Hailstorms on 4th, 14th, and 20th. Aurora on 2nd and 5th. Max. temp. 65°·5 on 27th; min. 27°·5 on 5th. Cuckoo first heard on 12th; nightingale on 17th; swallows seen on 15th.

BANBURY.—Hail on 5th and 29th; aurora, 11th. Max. temp. 75° on 27th; min. 28° on 30th. Cuckoo on 20th; swallows on 13th; apple in bloom on 27th.

WISBECH.—Max. 77°·4 on 27th; min. 32° on 30th. Hail on 5th and 30th; L on 2nd and 14th. Swallow on 13th; pear in bloom on 22nd; apple on 25th; field elm in leaf, 21st; wych elm, 23rd; lime, 25th; sycamore, 26th; walnut, 28th.

CULFORD.—First half of month showery, second, fine. 26th, 27th, and 28th unusually warm, the max. being respectively 70°, 76°, and 68°, while the 29th and 30th were cold, the wind being east, and max. only 51° and 48° respectively.

GOODAMOOR.—Max. temp 66°; min. 28° on 30th. Strong E. wind on 23rd, doing much damage to trees and buildings. Cuckoo heard and swallows seen on 16th; swift seen on 26th. L on 6th.

ORLETON.—Temp. very variable, but above the average. Max. 71°·5 on 27th; min. 30° on 30th. Grass min. below 32° only on 3 nights. On 28th, a sudden change from heat to cold. Cuckoo heard on 19th; first swallow seen on 13th; white-throat and willow wren on 21st. A few flakes of snow on 30th.

WIGSTON.—Season rather more forward than usual, as shown by the hawthorn and deciduous trees, and the unusually early appearance of the swallow, and sound of the cuckoo. Max. temp. 81°·5 on 27th; higher than I have ever known in April. Min. 26° on the 29th.

WEST RETFORD.—T and L on 14th; slight snow on 30th. With a few exceptional days, this has been a dull, cold month, the wind having been chiefly E., N.E., and N. Max. temp. 74° on 27th; min. 23° on 30th. Vegetation very backward, owing to the generally cold weather, and insufficient rainfall.

MANCHESTER.—The unusually small rainfall of April has, no doubt, been caused by the great prevalence of north-east winds, the black bulb in vacuum recorded 126°·8 on the 27th, a very high reading for April.

ARNCLIFFE.—Rainfall considerably below the average. A long prevalence of E. winds, and a backward spring. Max. temp. 64° on the 27th; min. 25° on 4th.

NORTH SHIELDS.—Hail on 1st, 14th, and 29th. Snow on 1st, 2nd, 3rd, and 30th. White rock cress in flower on 1st; Jerusalem cowslip on 8th.

SEATHWAITE.—More than 1 in. of rain on 2 days. East winds, with excessive hygroscopic dryness. At Tarnbank on 26th, at 3 p.m., dry bulb, 71°·0; wet bulb, 56°·2: diff. 14°·8. Evap. in 24 hours = ·410 in. On morning of 30th, min. at 4 feet, 26°·9 and on grass 16°·4.

WALES.

ABERCARN.—The month has been generally dry, but cold; the alternations of temp. being sudden and frequent.

HAVERFORDWEST.—On the whole, a fine month; air generally cold, but with frost only on the 3rd, 29th, and 30th. Vegetation forward; the dry weather from the 16th to the 27th enabled the farmers to complete their sowing, which had been much retarded by the wet, and late cold of the winter. There was much high wind, but no heavy gale. A warm period occurred about the 26th and 27th, followed by a sudden fall of temp. to the end of the month. Max. 70°·5; min. 29°. A splendid meteor about 4 a.m. on the 12th; it appeared like a ball of white luminous matter, and burst into a series of stars like a sky-rocket, and disappeared.

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CEFNFAES.—A dry April; parching winds from the N.E. prevailing during the month; and, at the end, all springs and sources of water very low. Cuckoo heard on the 16th, and corncrake on 29th. Max. 65°; min. 27°.

SCOTLAND.

DUMFRIES.—Showers on the 1st and 2nd; thence to the 10th, frosts at night, and cold, withering east winds by day. The next week mild and showery, vegetation making much progress. From the 20th to the close, weather dry, except on the 27th. Sowing completed under favourable circumstances in the beginning of the month, the oat and barley brairds looking fresh and vigorous, but the dry and frosty weather towards the close of the month checked the growth of the grass. On 30th, the fruit-trees in blossom (especially pears and plums) were much injured by the frost. Cuckoo heard on the 19th. On the last of the month the *winter* snows had not disappeared from the hollows of the Wamphray hills. Max. 75°·5 on 27th; min. 28° on 4th; T on 27th.

HAWICK.—Snow on the 1st, 2nd, and 30th. Swallows first seen on 29th. First half of month very cold, wet, and windy, and agricultural operations almost at a stand-still; the latter half fine, except the last two days.

AUCHENDRANE.—Rainfall in April, 1861 = ·61; in 1865 = ·67; 1866 = ·77; min. below 32° on 7 nights, on grass on 15 nights. The early potatoes, and plum tree blossoms, injured by the frosts of the 29th and 30th. On 26th, max. in sun 101°, in shade 69°; humidity at 2.45 p.m. only 35°; evap. from a water surface, 5 inches in diameter, amounted to ·25 in 24 hours.

OTTER HOUSE.—Rain more or less from the 11th to the 21st—none before or after. TS on 19th. Frost on 3rd, 5th, 29th, and 30th. Weather favourable for agricultural operations, though rain is rather wanted. The cuckoo's welcome note was *heard* on 26th, and they are generally seen a fortnight before they are heard.

FORT WILLIAM.—N.E. winds from the 1st to the 11th, then S.W. to 15th, when it blew a gale; and N.E. again at the end of the month.

NOOKTON.—Cold and ungenial. Min. 27°·4 on 30th.

DEANSTON.—T on 13th and 14th. *Very dry* and sunshiny from 23rd to 26th. Cold, with hard frost on the 29th and 30th, min. on grass 24° and 21° respectively. Max. in shade 64°·5 on 26th, min. 25° on 4th.

LOGIERAIT.—Cold E. winds throughout the month. From the 20th, onwards, there has been great warmth and sunshine during the days, but frost and cold E. wind during the nights; the rainfall was confined to the 10th to 19th, there being only two other days (the 26th and 30th) on which any fell, and that of the 30th was only ·01, and chiefly from snow.

BALLATER.—Temp. very changeable, ranging from 20°·5 on 1st, and 22°·5 on 30th to 71°·7 on 27th; the week preceding the 27th remarkably fine, but the month closed very stormy and cold. Ice ⅜-of-an-inch thick on water on the 30th. Four rainbows were observed, a magnificent double one on the 13th, not rising higher than the hill tops at 2 p.m.; several peals of thunder were heard on that day.

ABERDEEN.—Hail on 2nd to 5th, 17th, 19th, 28th, and 29th; fog on 10th, 11th, 12th, 25th, 26th, and 27th. Max. 75°·3 on 25th; min. 29°·5 on 30th; 21° on grass. A cold, raw month, but very quiet—no gale.

PORTREE.—The month, on the whole, has been cold, although the amount of sunshine has been above the average. Mean. temp. of month, 46°·1. Min. in shade 25°·4; on grass 15°·8 on 29th. No gales during the month, but very squally from the 13th to 16th, with heavy hail showers. Max. in shade 67°·0 on 25th and 26th. Cattle and sheep very weak from the heavy rains of the first three months of the year, but otherwise healthy.

LOCHBROOM.—The month, on the whole, has been a cold, dry one; the spring unfolding slowly, but gradually, until the 22nd, when the most beautiful weather burst upon us all at once till the 27th, when a most sudden and unwelcome change took place. Snow, intense cold, and hail as large as grape shot became the order of the day to the end of the month.

HELMSDALE.—Since the 26th the weather very cold. Snow, 4½ inches deep, fell on the morning of the 29th.

SANDWICK.—The month has been dry and cold; temp. 1°·4 below the mean. Ground sprinkled with snow on 2nd, 29th, and 30th; two peals of thunder on 13th; aurora on 5 nights; the prevalent direction of the wind was evidently the cause of the cold and dryness, it being N.N.E. and S.E. 19½ days.

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IRELAND.

MONKSTOWN.—Gale on the 2nd; severe one on 16th; the first part of the month rather wet, rain having fallen almost every day, though only in small quantities. In the middle of the month the temp. was high, but the last few days were bitterly cold and harsh. Snow on the 29th, which continued lying on the mountains. Prevailing wind, easterly; it having ranged from N.E. to S.E. on 21 days; frost on the grass on several nights; temp. below 32° on 6 nights. Min. 27° on 4th; max. 66° on 21st. Vegetation fairly forward; gooseberries, currants, and wall-fruit in most cases being well formed.

DOO CASTLE.—T on 30th. No growth of any consequence this month; farming operations in a very backward state; cold N.E. winds for the last eight days, destructive of all growth.

OWENDOON.—Hail on 1st and 30th; 2 in. of snow on 2nd, rather wet till 19th, then fine to 27th; cold to the close. Vegetation and spring work very backward. Swallows on 14th, cuckoo on 18th.

WARINGSTOWN.—Cold and ungenial, with easterly winds till the 12th; stormy and unsettled to 18th; then 10 days of fine seasonable weather, followed by two intensely cold days, and a most damaging frost on the night of the 29th, on which the min. was 26°. Frost on grass on 8 nights.

LECKPATRICK.—Very dry month; cold, parching easterly winds being prevalent. The rainfall less than in any April for 5 years; but, owing to the great fall during the previous months, the total fall for this portion of the year exceeds that of any previous one during that period—1862 = 14·01; 1863 = 10·04; 1864 = 10·69; 1865 = 13·23, and this year = 15·33.

GALE OF FEBRUARY 11TH, 1866.

Want of space prevented that earlier special notice of this gale which its local violence fully required. At all English stations, and the two Irish ones quoted herein, the lowest reading of the barometer in the month was on the 11th; and, therefore, the following readings are not only the minima of the gale, but also of the month.

BAROMETER REDUCED TO SEA LEVEL ON FEBRUARY 11TH.

STATION.	COUNTY.	Bar. at 9 a.m.	Lowest Reading and hour of occurrence.	Decrease.
		inches.	inches.	inch.
Waterford	Waterford	.....	28·91	.....
Dublin	Dublin	.....	28·89	.....
Kendal	Westmoreland	.....	28·97	.....
N. Shields	Northumberland	.....	28·82	.....
York	York	.....	28·80	.....
Pentyrch, Cardiff	Glamorgan	28·85	28·55 at 5 p.m.	·30 (*a*)
Llanfrechfa, Newport	Monmouth	28·93	28·52 at 3 p.m.	·41
Boyce Court, Dymock	Gloucester	.....	28·12 at 3 p.m.	..... (*b*)
Belgrave, Sidmouth	Devonshire	.....	28·58 at 1 p.m.	.....
Holford, Bridgewater	Somerset	.....	28·70	.....(*c*)
Bath	,,	.....	28·50	.....
Banbury	Oxford	.....	28·48 at 5 p.m.	.....
Ryde, Isle of Wight	Hampshire	29·06	28·73 at 2 p.m.	·33
Reading	Berkshire	.....	28·48	..... (*d*)
Eton	Buckinghamshire	29·16	28·61 at 5 p.m.	·55
Betchworth	Surrey	.....	28·62	.....
Camden Town	Middlesex	29·25	28·61 at 4½ p.m.	·64 (*e*)
Dover	Kent	.....	29·10	.....
Sudbury	Suffolk	.....	28·54	.....
Wisbech	Cambridge	.....	28·71	.....
Mattishall, E. Dereham	Norfolk	.....	28·54in afternn.	.....

(*a*) Bar. never so low before. No gale here.—(*b*) Not reduced to Sea Level. The calmest day this year.—(*c*) Gale from S. to N.W.—(*d*) Terrific gale.—(*e*) Heavy gale all the afternoon, with rain.

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REMARKS.—*Ryde.*—On the 11th, a violent storm commenced about 4 a.m.; wind, S.S.W.; from 12 to 3, wind W.S.W., and blowing a complete hurricane. From 2 to 3 it raged with great fury. Large trees were blown down in all parts of the island, to the number of above 800; stacks of chimneys, tiles, slates, lead and zinc roofing torn away like paper, and many other damages. Two or three vessels at the Motherbank broke from their anchors, and one drifted on the Woolsiness, and was lost, with all hands. It is now thirty years since Ryde was visited with such a terrible hurricane, and that occurred on the 29th Nov., 1836. *Camden Town.*—Lowest barometer for at least 10 years; next lowest, 1859, December 26th, 6 a.m., 28·629 inches. *Mattishall.*—Lowest reading for 4 years, and though windy and wet, the weather was by no means commensurate with such an extraordinary depression.

The gale was very violent and destructive at Truro, Falmouth, Penzance, St. Ives, Poole, Portsmouth, Selborne, London, Chatham, and Yarmouth (Norfolk). Less violent, but still a high wind at Goodamoor, Calne, Taunton, W. Retford; did not reach the Northern Counties, Scotland, or Ireland, at all.

At Rouen the gale was very violent, and blew a train of empty carriages over the blocks, and on to the main-line, on which a train from Paris met and smashed eight of them. At Antwerp (as in several parts of England) the gale was accompanied by a heavy thunderstorm, and the waters of the Scheldt became so rough that two vessels were wrecked.

The Board of Trade reported—"The gales of Saturday night, 10th, and Sunday, 11th, were of unusual violence, and appear to have been most severely felt on our southern coasts. The disturbance seems to have partaken, in some degree, of a cyclonic character. It seems probable that the area of least pressure, or centre of the storm, passed in an easterly direction, not very far to the northward of London."

It will at once be seen that the above minima, although remarkably low for the south of England, are greatly above those given by Mr. Cunningham *(Met. Mag. p. 16)* for the Scottish stations on December 31st, 1865. The path of the storm seems to have been somewhat similar to that of the Royal Charter storm, with less N. in its direction, and rather to the S. of that celebrated track.

ARRIVAL OF BIRDS.

From the reports on pages 31 to 33, and others, we find the dates to have been—

Cuckoo—11th at Linton Park; 12th at Selborne; 14th at Hillington, Lynn (Norfolk); 16th at Goodamoor and Rhayader; 18th at Owendoon; 19th at Killingholme, Ulceby, (Lincoln,) Orleton, and Dumfries; 20th at Banbury; 21st at Halifax; and 26th at Otter House.

Swallows on 13th at Orleton and Wisbech; 14th at Killingholme and Owendoon: 15th at Selborne; 16th at Goodamoor; 19th at Dublin; 29th at Hawick.

EQUIVALENT EXPRESSIONS OF WIND FORCE.

It has been suggested as desirable that the terms originally coupled with the sea scale 0—12 should be given. They are—

0 Calm.	3 Gentle Breeze.	6 Strong Breeze.	9 Strong Gale.
1 Light Air.	4 Moderate Breeze.	7 Moderate Gale.	10 Whole Gale.
2 Light Breeze.	5 Fresh Breeze.	8 Fresh Gale.	11 Storm.
			12 Hurricane.

LATEST INTELLIGENCE.

DUMFRIES.—On night of May 1st, a heavy fall of snow on the hills, being very deep on the mountain ranges round Moffat.

HELMSDALE.—Snow on May 1st, very trying for the lambs.

DUBLIN.—May 1st, a heavy fall of snow, and hail on 2nd.

The Cleveland hills, the moors, and the highest wolds in Yorkshire were covered with snow on the 1st, 2nd, and 3rd.

At Barton Seagrave, near Kettering, the min. in air on the 4th, was 23°·2. At Camden Town the air temperature did not fall below freezing point, but the grass temp. fell to 25°·5.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

V.] JUNE, 1866. [PRICE FOURPENCE, or 5s. per ann. post free

BLACK RAIN.*

PERSEVERANCE is said to command success; if so, unless an early protest be raised, we may soon find a popular belief in frequent falls of volcanic matter in different parts of the British Isles. While we accept most of Mr. Rust's facts, we dispute *in toto* his deductions; but that our readers may fairly understand the case, Mr. Rust shall speak—first, by the reproduction of a paragraph recently quoted by the *Times* from the *Aberdeen Journal*; secondly, by extracts from the work above quoted. On both we will then briefly comment.

BLACK RAIN.—The black rain showers, which are now so well known in Scotland, and about which the inhabitants of a part of Aberdeenshire are in the way of speaking with no greater astonishment, when one of them falls from a peculiarly-coloured dark cloud, blackening materials exposed to it, than they speak of a white shower from a snowy cloud, have been at last recognized in England. Between the beginning of January, 1862, and the middle of January, 1866, there have been no fewer than eight authenticated black showers in Scotland. Seven of these fell in Slains and the extensive surrounding district. Two of them were accompanied with pumice stones, some of the balls of which measured 8 to 10 inches in diameter, and weighed upwards of a pound avoirdupois. The first four, including the Carluke shower, and the eighth, were contemporaneous with outbursts of Vesuvius, and the intermediate three with those of Etna. But now through the instrumentality of the Rev. Mr. Rust, of Slains, who was the first to draw general attention to the Scottish showers, it has been discovered that England gets her share likewise of black showers, although she did not think that she was so distinguished. On the 3rd of May of the present year (1866), at 11 a.m., and again at 4 p.m., the town of Birmingham and the surrounding country were for three-quarters of an hour each time enveloped with black clouds producing darkness and rain. Accidents took place in the streets, vehicles were upset, and gas had to be lighted at some of the crossings, and nearly in all places of business. Mr. Rust, writing for information, got inquiries instituted, and the result is found to be, that a large quantity of black rain, similar to the Scottish, fell, and blackened rain water in tanks and clothes on greens, not only in Birmingham itself, but at rural places many miles distant, unaffected by soot and smoke, and even windward of that town. So far as known, however, no word has yet arrived of any volcanic outburst, although, judging from what has taken place in Scotland, a probability exists that some volcano has been in a state of activity, emitting its contents, whether it be heard of or not.

The following are extracts from Mr. Rust's work. Speaking of the first shower, he says :—

"The rain blackened, as if with sooty drops, all the white or light coloured clothes exposed to it on the bleaching or drying greens, so that they required to be re-washed; and cold water and soap were not sufficient to eradicate the stains, therefore hot had to be applied, and some of the clothes required to be boiled be-

* *The Scottish Black Rain Showers, and Pumice Stone Shoals of the years* 1862 *and* 1863. By the REV. JAMES RUST, A.M. W. Blackwood and Sons.

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fore they regained their former colour; but by such hot applications, the spots were completely eradicated."

We may here remark, that one of the shirts, probably one of the most strongly marked, was sent up to Admiral FitzRoy, who wrote that he "could not discover the *least trace of discoloration* left on the shirt (which was somewhat *damp* when left at the Meteorological Department and opened)." And again, "The shirt does not show any *definite* markings, except in one place, not to be safely identified as a discoloration by *rained* water." Resuming Mr. Rust's narrative:—

"The rain-water collected by spouts from the roofs of houses, and conveyed into casks, was completely darkened, and filled with black particles for a time held in suspension. It was also hardened, so that, unlike all ordinary rain water, it did not froth or make a lather with soap, but curdled the soap, as water impregnated with carbonic acid gas, or hardened by carbon or soot does. It likewise gave out a nasty, disagreeable, stinking smell, so as to be quite unsuitable for domestic purposes. This must have been partly caused by sulphur, combined, perhaps free, but undoubtedly in the form of sulphuric acid gas. . . . . Immediately after this occurrence of the black rain, it was found that the sea had floated to land, and stranded all along that part of the coast of ten miles extent, which had been covered by the cloud, and no other part, a vast collection of pumice stones. They lay like a shoal of stranded fish. They could have been gathered along the shore by waggon loads the thousand yards, and there were pieces weighing half a pound avoirdupois. Such an occurrence had never been heard of before as having happened on the coast of Slains."

The chapter entitled "The result arrived at," is far too long (17 pp.) for verbatim reproduction, but it may be epitomized in a very few lines. Our author, who has referred to soot, smoke, chimneys, and carbon, on every fourth or fifth page of his narrative, rejects it directly he comes to theorize on the cause of the blackness of the water, and unhesitatingly affirms that it came from Vesuvius. He does not say why the pumice stones and fine impalpable powder travelled some 1500 miles at the same rate, which must have been the case if both arrived together; he does not say why the parish of Slains is so uniformly honoured with these showers, that "seven black showers" have fallen there, and only one in any other part of Scotland; he does not explain why the showers are seldom noticed further inland than Slains, nor why their breadth is so slight as 10 or 20 miles; but he calls upon us to believe that "Vesuvius emitted the pumice stones, and the black, sulphureous, carbonaceous, acidiferous substances contained in the showers;" that the light powdery dust and pumice stone blocks, half a pound in weight, travelled along at equal speed, and in close companionship, far above the snowy summit of Mont Blanc (or it would be blackened), and on, still on, for hundreds of miles, with not a variation of half a degree in their course, until they reach their destined resting-place on the Aberdeenshire coast, when *all* the pumice stones are dropped into the sea, and black rain on the selected village of Slains.

It is almost impossible calmly to review such a theory, and yet it is equally objectionable to allow it to pass unchallenged, especially looking at the ready circulation always accorded to the marvellous; perhaps divesting it of circumlocution, and stating it plainly as above,

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it is almost sufficiently self-condemning. Who can believe in the transport to the same distance, and with equal velocity, of light, sooty matter, and blocks of pumice stone weighing half a pound (by the bye, they are said to weigh a pound in the newspaper extract; why is their weight doubled?). Who can believe that the wind on seven out of eight occasions blew in a perfectly uniform line, not varying 5 miles to the right or left, in a course between one and two thousand miles long? We will briefly remark, that residents in the neighbourhood do not concur in Mr. Rust's report of waggon loads of pumice, or in his theory of its origin; and that a specimen was submitted to Professor Hofman, who reported—

"Chemical analysis has proved the mysterious material you forwarded to me to be essentially a silicate of lime containing in addition, oxide of iron, alumina, magnesia, sulphuric acid, hydro-chloric acid, and phosphoric acid; of the latter only traces. These are exactly the constituents which are met with in the products of volcanic eruptions, but they are also the constituents of the slags which are found in every smelting furnace of our ironworks. Chemical analysis then is unable to decide the origin of the material in question. Had the specimen which you transmitted to me been placed in my hands without further remark, and had I been asked to state what I thought the substance was, I would have said *the frothy slag of an iron work.*

We have only to add, that such slags are quite common at Aberdeen (20 miles off), where there are at least four large iron foundries, two of them at the mouth of the Dee. Is it not more likely that the material travelled some 25 miles from Deeside, on the surface of the water, than that it floated gossamer-like in the air for sixty times that distance? But what of the black rain? We believe the origin is equally simple, and that it really arises from the chimneys, to which every one seems to have attributed it until Mr. Rust suggested the more marvellous origin. We do not presume to say whether it was smoke from Aberdeen, from passing steamers, or from the fish-curing village of Colliston; but we could hardly have stronger evidence that smoke is at the bottom of the whole matter than is afforded by the two other localities where "black rain" has been observed—viz., Carluke, amid the iron foundries of Lanarkshire, and Birmingham, where we were jokingly offered any quantity of "black rain" a year or two since, and where now Mr. Rust has discovered it.

Having inquired of one of the rainfall observers at Birmingham, we have been favoured with a reply from which the following is an extract—"I imagine that none but country people who wash in crystal, and the wonder-seekers who have a theory to support, would discover the rain of that day to be much blacker than usual."

We are by no means prepared to deny that rain *may* bring down volcanic dust and be thereby darkened, but if it does we shall surely hear of it not from one parish, or even one county, but from observers in all parts of the kingdom; therefore, as well as for the reasons already given, we take leave of Mr. Rust, begging him for his own sake and for the credit of the nineteenth century, rigorously to sift the facts ere he again announces a fall of black rain.

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RAINFALL IN MAY, 1866.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground	Above Sea Level.	Depth of Rain. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	inches.	inches.		
I.	ENGLAND.	Camden Town	0 6	100	2·03	— ·37	·63	31	10
II.		Staplehurst (Linton Park)	0 6	200 ?	·81	—1·43	·24	11	8
,,		Selborne (The Wakes)	4 0	500 ?	1·56	— ·93	·34	10	9
III.		Hitchen	2 0	240	1·04	— ·89	·25	11	9
,,		Banbury	7 0	345	2·17	— ·05	1·18	31	10
,,		Wisbech	0 6	10	1·74	...	·45	10	9
IV.		Bury St. Edmunds (Culford)	1 2	...	1·66	— ·50	·32	2	11
V.		Calne	0 11	250	1·15	...	·45	10	9
,,		Plymouth (Goodamoor)	0 2	580	3·16	— ·10	·63	31	12
,,		Barnstaple	0 6	31	1·05	—1·39	·44	11	8
,,		Taunton (Fulland's School)	1 4	...	1·64	— ·41	·83	27	11
VI.		Shrewsbury (Highfield)	5 6	200	1·56	—1·03	1·07	31	8
,,		Tenbury (Orleton)	0 9	200	·94	—1·94	·23	11	11
VII.		Leicester (Wigston)	0 6	220	1·10	...	·34	11	9
,,		West Retford	0 6	50	1·07	—1·23	·27	10	9
,,		Derby	5 0	180	1·75	— ·41	·58	31	11
VIII.		Manchester	2 7	106	1·54	—1·12	·76	11	9
IX.		York	0 6	50	·58	—1·37	·39	11	6
,,		Skipton (Arncliffe)	3 0	750	1·92	—1·43	·80	10	6
X.		North Shields	1 0	124	1·14	—1·50	·66	10	8
,,		Borrowdale (Seathwaite)	1 0	422	5·06	—4·48	2·24	9	8
XI.	WALES.	Abercarn	1 3	450	1·06	...	·40	11	12
,,		Haverfordwest	2 0	60	1·36	—1·36	·46	11	11
,,		Rhayader (Cefnfaes)	2 0	880	1·18	—1·67	·48	11	7
,,		Llanberis (R. Victoria Hotel)	1 0	370	3·68	...	·98	11	9
XII.	SCOTLAND.	Dumfries	0 5	70	1·41	— ·97	·54	10	11
,,		Hawick (Silverbut Hall)	4 0	512	1·40	...	·54	10	8
XIV.		Ayr (Auchendrane House)	2 3	94	1·94	—2·17	·88	10	11
XV.		Otter House	0 6	130	1·66	—2·08	·75	11	9
XVI.		Leven (Nookton)	0 6	80	1·50	— ·50	·56	10	9
,,		Stirling (Deanston)	0 0	130	1·11	— ·54	·50	10	9
,,		Logierait	1 0	250	·80	...	·30	11	5
XVII.		Ballater	0 10	656	2·30	...	1·10	11	14
,,		Aberdeen	4 8	115	1·72	...	·31	28	15
XVIII		Inverness (Culloden)	3 0	104	1·34	...	·30	12	9
,,		Fort William	0 8	20	2·06	...	·38	7	13
,,		Portree	0 4	60	1·95	—3·70	·50	8	13
,,		Loch Broom	0 8	48	2·16	...	·50	9	12
XIX.		Helmsdale	1 0	34	1·57	...	·27	2&11	16
,,		Sandwick	2 0	78	2·15	— ·11	·67	9	12
XX.	IRELAND.	Cork	6 0	65	2·11	...	·96	30	12
,,		Waterford	4 0	60	1·28	— ·97	·26	13	12
,,		Killaloe	5 0	128	3·06	— ·12	·88	13	15
XXI.		Portarlington	9 0	236	1·19	—2·00	·52	13	16
,,		Monkstown	0 6	100	1·58	— ·33	·72	31	10
XXII.		Galway	6 0	25	1·97	...	·39	8	17
,,		Bunninadden (Doo Castle)	1 0	...	1·71	...	·42	13	14
XXIII		Bawnboy (Owendoon)	1 3	218 ?	1·93	...	·63	11	12
,,		Waringstown	0 4	191	1·27	...	·42	11	9
,,		Strabane (Leckpatrick)	0 5	260	1·44	...	·37	10	15

+ Shows that the fall was above the average; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; and T S for Thunderstorm.]

ENGLAND.

CAMDEN TOWN.—Gale at 6 p.m. and hail at 7 p.m. on 11th. Strawberry in blossom on 21st. No rain from 12th to 26th; hail and heavy rain on 31st.

LINTON PARK.—A cold ungenial month, dry withering winds from E. and N.E., with scarce a particle of dew. Five frosty mornings, and two others nearly so, while in April we had only two frosts, and the average night temperature of that month was as near as possible that of May, being 39°·15 against 39°·81; the hottest day in April was 5° above any day in May. Hardy fruits may recover, but the hay crop must be short; hardy vegetation 4 or 5 days behind the usual time, delicate things still more so. T heard on five occasions.

SELBORNE.—Hail with T on 2nd; T with rain on 26th; boisterous evening with aurora on 11th. Max. 66° on 28th; min. 28° on 4th and 16th. Frost from 2nd to 5th, and 16th to 19th inclusive.

BANBURY.—T on 3rd, and, with one flash of L and heavy rain, on 31st. No rain from 12th to 31st; sharp night frosts to the end of month. Potatoes, Gooseberries, and wall fruit much injured. Max. 69°·5 on 19th. Min. 24°·5 on 4th.

WISBECH.—T on 4th & 27th. Solar halos on 8th & 30th. Oak in leaf on 15th, lilac in bloom on 9th, laburnam on 12th, honeysuckle on 21st, mountain ash on 22nd.

CULFORD.—T on 3rd, 4th, 12th, & 27th. Grass crisp with frost on 29th. Max. 75° on 23rd. Min. 28° on 3rd. Latter part of the month dry with cold east winds, fine gentle rain on 31st, which was much needed.

CALNE.—T S on 12th and 26th. L on 13th. Nights cold, 7 being frosty.

GOODAMOOR.—Much snow fell on the 3rd, on Dartmoor. Frost on 13 mornings. Max. 70°, Min. 22° on 4th. Wind easterly from 14th to 31st, at times blowing a perfect gale; 24th & 25th were very stormy, coming on at night.

TAUNTON.—Ice ½-of-an-inch thick on 19th, with piercing east winds.

ORLETON.—Snow on the hills on the 2nd. Severe frost till 6th, and on the 30th, injuring potatoes, beans, and the shoots of ash and oak. T on 3rd, 4th, 27th, & 31st. No rain from 13th to 31st, the air being dry and sky cloudless; on 31st a little rain before sunrise, it then got cloudy with a strong cold east wind till 1.30 p.m., rain then commenced, increasing till 2 p.m., when for nearly an hour an immense fall of rain took place in gusts from 2 to 5 minutes; at 3 p.m. more than 1 in. had fallen, it continued all the evening till 9 a.m.; on the 1st of June I registered 2·655 of rain, the greatest fall in 24 hours since 1852. As I have always entered the rain to the day on which it was measured, this will come into June; two or three peals of T were heard on the 31st before the rain set in, but the heavy rain did not extend more than a few miles in any direction.

WEST RETFORD.—This has been a most ungenial month; cold, drying, easterly winds, and a lack of dew or rain, added to a low temperature, have kept back all vegetation. Frost on 8 nights; max. 76° on 19th; min. 28° on 4th. The rainfall for the first 5 months of this year is ·97 below the average of last 7 years.

DERBY.—Cold, ungenial month, vegetation making little progress, and the frosty nights seriously injuring potatoes and kidney beans, while gooseberries, currants, and small fruit have disappeared.

MANCHESTER.—T on 11th. Excessively dry and cold, with E. winds.

ARNCLIFFE.—An unusually dry month, with cold wind, mainly from the east.

N. SHIELDS.—Cherry in blossom on 18th, apple on 25th, strawberry on 27th.

SEATHWAITE.—Prevailing wind E., with extreme dryness; at 3 p.m. on 20th, at Tarn Bank, dry bulb, 72°·8, wet bulb, 57°·2, difference 15°·6.

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WALES.

ABERCARN.—A very dry month; prevalence of N. and E. winds, but it has been generally calm.

HAVERFORDWEST.—The coldest May since 1855; prevailing wind E., doing much injury to vegetation, and causing sickness and mortality; from 11th to 13th a strong gale from E.

CEFNFAES.—The coldest May for many years; sunny days, but frosty nights retarding vegetation; water scarce, no rain from 13th to 31st. Max. 69°; min. 24°.

SCOTLAND.

DUMFRIES.—First part of month wintry, with frost and snow; on the 2nd the whole country white with snow, which however soon melted. 8th to 11th showery, thence to the end of the month dry with low night temperature. The pastures much injured by the drought; on morning of 30th, potatoes blackened by frost; on 31st a slight fall of snow; hay crop likely to be light; dahlias nipped on 15th, hawthorn in blossom on 22nd.

SILVERBUT HALL, HAWICK.—First half of the month cold and frosty, with hail, snow, and sleety showers; latter half generally fine, except the last four days, which were very cold with "hask" winds. Farmers are loud in their complaints about the scarcity of fodder; hay almost used up, and the pastures bare.

AUCHENDRANE.—The cold of the beginning of May, so generally noticed, was felt here also; ther. on 4 nights at or under 32° in the first week. 1·76 in. (of the total 1·94 in.) of the rain fell in the first 12 days.

OTTER HOUSE.—No rain from 12th to end of the month; the continued drought stints the hay crop, for "May makes the hay;" the other crops look well. On the 29th, a hail shower, and snow on the distant hills, which soon melted.

FORT WILLIAM.—For half the month there was a bright sun and soft airs from S.W. On Ben Nevis and many neighbouring hills a good deal of snow still remains, contrasting strongly with the summer aspect of things at a lower altitude. Fresh snow on the hills on 28th.

NOOKTON.—Very cold for the month; min. 32°·4 on 16th; from 19th to 26th clear, with east winds.

DEANSTON.—Max. 73°·3 on 23rd; min. 26° on 15th. Month very dry, with E. winds; end of month very cold and some hail-storms. Plum and peach blossoms much damaged, and little prospect of a moderate crop.

LOGIERAIT.—With very hot days, severe frosts at night, and a rainfall of only ·80, vegetation is necessarily backward and pastures suffering, but the cereals are as yet uninjured, and the fruit blossoms unusually luxuriant.

BALLATER.—The weather in the early part of the month very unsettled, the hills having a fresh coating of snow on several mornings. Fine from 13th to 26th; thunder on 10th, on which day the cuckoo was first heard. Max. 69° on 19th and 20th; min. 25° on 1st. Influenza very prevalent in the early part of month.

ABERDEEN.—Max. 64° on 23rd; min. 29°·3 on 1st; from 13th to 27th only one shower, but there were copious dews.

CULLODEN.—No rain from 14th to 29th; very hot on 25th; sharp frost on 1st; snow on 2nd; frequent hail-showers on 3rd; middle of month dry and sunshiny; heavy hail showers on 29th.

PORTREE.—Cold and squally, with showers of snow and rain to the 12th; then to 27th dry and hot, with cold nights; thence to end of month very cold, with hail showers; 31st warm. Frost on 14 nights. Max. 75° on 20th. The crops look better than might have been expected, the soil being soaked with rain of previous months, the hot sun brought vegetation forward in spite of the frosts. Cattle still healthy; no disease.

LOCHBROOM.—Cold, dry, and wet alternately, from 1st to 12th; then dry with hot sun till 20th, when the heat became intense; after 27th it changed again to cold, hail, sleet, and snow.

SANDWICK.—Ground white with snow on morning of 2nd; sun pillar in afternoon. Month cold and wet; the usual cold days from 10th to 15th; sleet showers so late as 27th and 29th. Prevailing winds, N. and E.

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IRELAND.

KILLALOE.—Snow on first three days, and the whole month remarkable for the continuance of cold and parching winds.

MONKSTOWN.—Cold till 5th, then to 13th warmer, no rain from 13th to 31st, during which time cool (and at times harsh) winds from E., N.E., & S.E., prevailed; about 10 p.m. on 30th rain commenced and continued almost without intermission till noon 1st of June. Apples and strawberries likely to be a heavier crop than has been known for years, and all fruit seems promising.

DOO CASTLE.—Beginning of month cold, with frost, snow, and hail. No rain of any account from 13th to 31st, the prevalence of E. winds during this period tended to dry up the earth, and vegetation was thereby not only retarded, but to a certain extent blighted. Both man and beast felt the effect of this long-continued drought.

OWENDOON.—Cold at commencement, crops and grass much injured by the cold winds and want of rain. Potatoes injured by frost on 29th.

WARINGSTOWN.—Month on the whole dry, cold, and ungenial. Crops suffering from want of rain and cold nights; that they have not been worse is probably due to the large amount of sunshine raising the heat of the ground several degrees above that of last May. Evaporation 2·73.

LECKPATRICK.—Month set in cold, latter half excessively dry, with cold winds from E. Dry bulb on 23rd at 3 p.m. 68°, wet bulb 55°; max. 80° on 20th. much sickness, chiefly feverish colds, influenza, &c.

WANTED — A SIMPLE RULE FOR MENTALLY DETERMINING DIFFERENCES OF HEIGHT BY THE BAROMETER.

To the Editor of the Meteorological Magazine.

SIR,—I do not intend to put my name to this, so of course am free to indulge in a little autobiography, as a partial explanation, partial justification, of the request I have to make. Time was when I should have scorned to pen it, and been strongly inclined to chaff you for inserting it; but college days are long gone by; hunting, shooting, and fishing, have obliterated the lessons of Alma Mater, and I fully concur in Mr. Gladstone's opinion of the arithmetical powers of M.P.'s, if I may judge by my own.

Now, Sir, the country round my place is very hilly, and we often have discussions as to the absolute and relative height of different hills. As I (unluckily) am the only one just hereabouts who has a conveniently portable aneriod, I am expected to settle these discussions. I have not the least objection to taking the readings, but I do greatly object to the bother of working out the corresponding altitudes. Our highest hills are under 1500 feet, most of them under 1000, surely some simple rules can be given to find the difference represented, say by 30·07 at the lower station, and 29·48 at the higher station, on a hot day in summer—without a lot of corrections for temperature at both upper and lower stations, corrections for reading at sea level, &c. Admiral FitzRoy used to say something about each tenth of an inch equalling 100 feet, *that* is not accurate enough. Somebody (I forget who) gives each foot equal to ·0011 inch. Cannot some of your readers give us a few *simple* rules, (mind I protest against rule of three and logarithms) for deducing heights correct say to within 30 or 40 feet. If with simplicity they can couple greater accuracy, so much the better, but simplicity is the principal thing, and whosoever therewith combines the greatest accuracy, will most oblige,

Yours very truly,

June 5th, 1866. A LAZY MAN.

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PERIODS OF DROUGHT AT CARDINGTON.

It may be interesting to some of the readers of this Journal to know the periods of dry weather of fourteen days and upwards since 1845, in one of the midland counties, where the monthly fall of rain is under 2 inches. I will also state the number of days in each year on which no rain fell, dates included.

		DAYS.			DAYS.
1846.	June 9th to June 22nd	14	1856.	Sept. 8th to Sept. 21st	14
,,	Sept. 7th to Sept. 22nd	16	1857.	August 17th to Sept. 1st. ...	16
1847.	March 8th to March 22nd ...	15	,,	Dec. 23rd to Jan. 7th, 1858	16
,,	Sept. 23rd to October 6th ...	14	1858.	March 18th to March 31st...	14
1848.	April 30th to May 18th	19	,,	June 19th to July 4th.....	16
1849.	July 4th to July 17th.....	14	,,	Nov. 10th to Nov. 25th.....	16
1850.	Feb. 17th to March 3rd	15	1859.	June 5th to June 19th	15
,,	March 5th to March 22nd ...	18	,,	July 5th to July 18th.....	14
,,	Sept. 5th to Sept. 19th	15	,,	Nov. 10th to Nov. 26th.....	17
1851.	June 17th to July 1st.....	15	1860.	October 27th to Nov. 10th...	15
,,	Sept. 6th to Sept. 23rd	18	1862.	July 21st to August 6th.....	17
1852.	March 3rd to March 29th ...	27	1863.	Feb. 5th to February 18th...	14
,,	April 1st to April 17th	17	,,	March 21st to April 4th.....	15
,,	June 30th to July 13th	14	,,	July 4th to July 18th.....	15
1853.	May 15th to May 28th	14	1864.	April 18th to May 1st.....	14
,,	July 30th to August 16th ...	18	,,	Sept. 24th to October 19th...	26
1854.	Feb. 24th to March 10th ...	15	1865.	April 20th to May 4th	15
,,	March 28th to April 20th ...	24	,,	June 4th to June 29th	26
,,	August 25th to Sept. 12th...	19	,,	August 30th to Sept. 20th...	22
1855.	April 13th to May 3rd	21	,,	Sept. 22nd to October 8th ...	17
1856.	Feb. 21st to March 16th ...	25			

Only seven times during twenty years have the number of dry days exceeded twenty at one time, and two of these times were in 1865.

The following shows the number of days in each year on which no rain fell, from 1846 to 1865, inclusive:—

Year.	Days.	Year.	Days.	Year.	Days.	Year.	Days.	Year.	Days.
1846	201	1850	223	1854	230	1858	240	1862	184
1847	230	1851	217	1855	225	1859	219	1863	234
1848	169	1852	204	1856	214	1860	169	1864	250
1849	193	1853	194	1857	220	1861	204	1865	232

From these figures it will be seen that it was in 1864 that there were the greatest number of days on which no rain fell; also in that year the least fall of rain took place, being 5·564 inches below the average of twenty years.

Cardington is situated about three miles from Bedford, one mile from the river Ouse, 12 feet above the level of the river, and 100 feet above the sea level. The weather is generally very dry in summer, and very damp in winter.—JOHN MCLAREN, *Gardener to S. C. Whitbread, Esq.* [*From the Journal of Horticulture.*]

LATEST INTELLIGENCE.

THUNDERSTORM AT HEREFORD, June 1st, 1866.—A thunderstorm occurred here at 5.35 p.m. from N.E.; about 6.3 p.m. the wind suddenly veered to S.E., and produced some very heavy rain for a few minutes; the lightning was very vivid at this part of the storm, and was followed almost instantly by a crashing peal of thunder. The storm abated at 6.40 p.m.; the amount of rain collected during this time was ·40 in. Barometer 29·51. The air close and oppressive on morning of 2nd.—WM. COOKE.

STORMS IN THE ISLE OF THANET.—Sunday evening, June 3rd, was oppressively close at Margate; soon after midnight, lightning became frequent with thunder; the storm increased until about 4 a.m., when it was excessively violent, with heavy rain. The morning was showery, and while walking from Sandwich to Shepherd's Well Station, 6 miles N.W. of Dover, occasional distant thunder was heard but only a few drops of rain fell. On reaching Dover I found that it had been visited with a very heavy storm and over an inch of rain. The first storm was most severe over Ramsgate and Margate about 4 a.m.; the second over Hythe, Folkestone, and Dover, in the afternoon. At Hastings the rain was under half an inch.—G. J. SYMONS.

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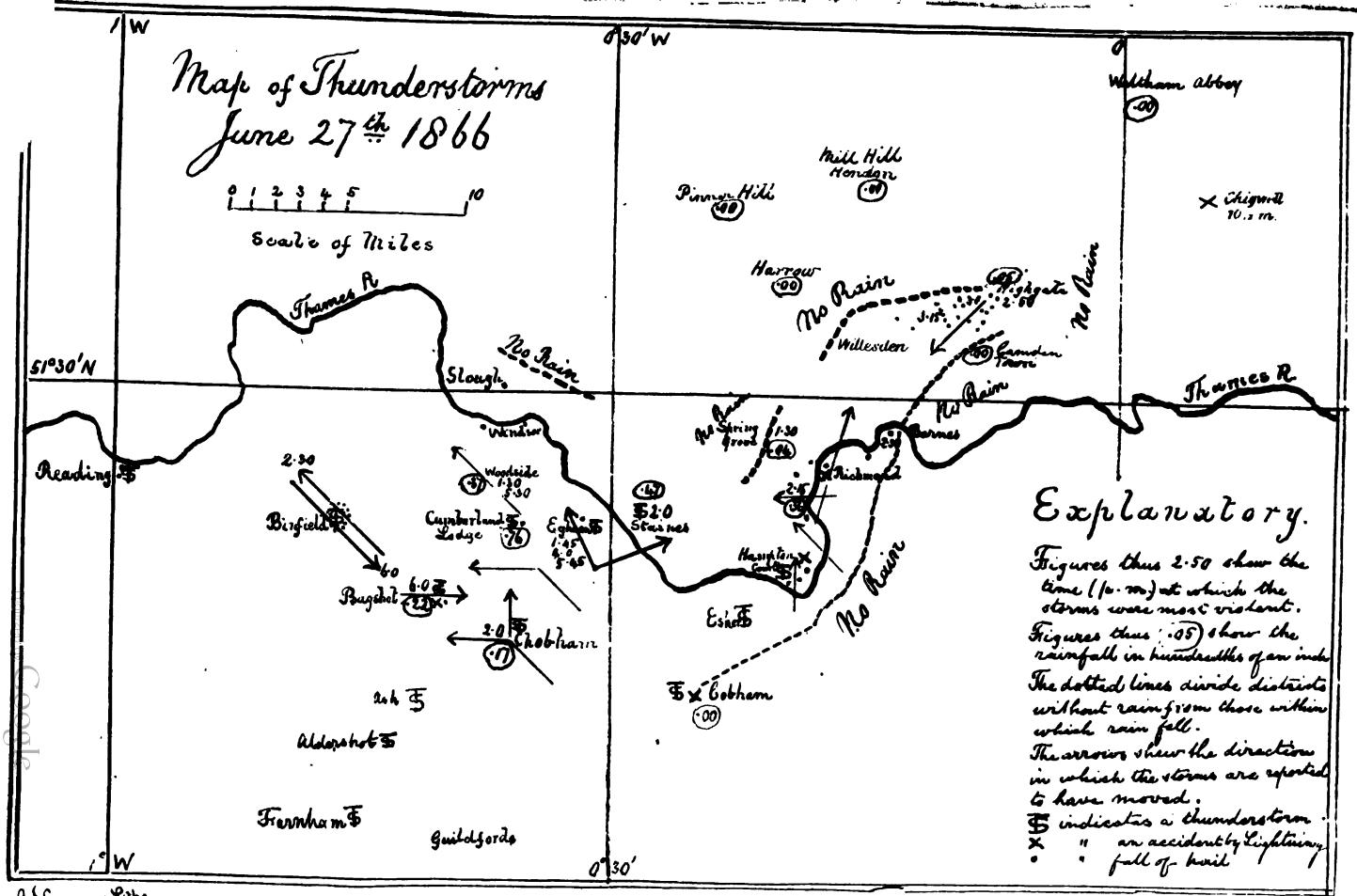
Map of Thunderstorms
June 27th 1866
0 1 2 3 4 5 10
Scale of Miles
1° W
0° 30' W
0
51° 30' N
1° W
0° 30'
Thames R
Reading
Slough
Windsor
Wokingham
Bracknell
Wargrave
Henley
Basingstoke
Aldershot
Farnham
Guildford
Cobham
Esher
Kingston
Richmond
Hounslow
Harrow
Pinner Hill
Mill Hill
Hendon
Willesden
Camden Town
Highgate
Hampstead
Hornsey
Tottenham
Walthamstow
Chigwell
Waltham abbey
Thames R
No Rain
2·30
Birfield
Cumberland Lodge
Wargrave
Englefield
Hampton Court
Chobham
Eshers
Cobham
Explanatory.
Figures thus 2·50 show the time (p. m.) at which the storms were most violent.
Figures thus (·05) show the rainfall in hundredths of an inch.
The dotted lines divide districts without rain from those within which rain fell.
The arrows shew the directions in which the storms are reported to have moved.
indicates a thunderstorm.
" an accident by Lightning.
" fall of hail

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THE STORMS OF JUNE 27TH, 1866.

IN arranging the following account of the thunder and hailstorms of June 27th, I have placed in the forefront a list of places where neither hail nor rain fell, so as to define at once, as far as practicable, the boundaries within which the storms were confined. I shall then proceed with such narrative as I have been able to compile, and lastly give the data on which it is based.

PLACES HAVING NEITHER HAIL NOR RAIN.

NORTH OF RAIN PATH.—Waltham Abbey, Whetstone, Kingsbury, Harrow, Pinner.

SOUTH OF RAIN PATH.—Stoke Newington, Islington, Camden Road, Portman Square, West Brompton, Surbiton Station, Buxley Hill (near Claygate, Esher), Berkeley Street, Upper Harley Street, Bond Street, Pimlico, Camberwell, Wimbledon, Peckham.

PLACES JUST ON THE BOUNDARY OF THE STORM, AND HAVING ONLY A FEW DROPS OF RAIN.

Colney Hatch, very little. *Barnet*, a few drops. *Zoological Gardens*, at 3 p.m. a few rattling claps of thunder, heavy rain drops and a few hailstones, it only lasted 2 or 3 minutes. Sun shining brightly on E. and S.E. of the park all the time. *Dorset Square*, at 3 p.m. a few heavy claps of thunder, and a little rain. *Avenue Road*, very slight rain. *Lord's Cricket Ground*, slight shower, very large drops. *Lancaster Gate, Bayswater Road*, a few large drops at 1.30 and 3 p.m. *Upper Westbourne Terrace*, at 2.55 slight showers, very large drops. *Kingston*, only a few drops of rain. *Ham Lane near Esher*, just laid the dust. *Claygate near Esher*, very slight shower. *Slough* (400 yards south of the station), slight shower about 3 p.m. for 10 minutes.

NARRATIVE OF THE STORMS OF JUNE 27TH.

THE laws regulating the paths of thunderstorms being, I believe, entirely unknown, and probably very complex, it is probable that notwithstanding all my pains, and the somewhat copious details on which this narrative is based, some persons resident in districts whence we have no reports (such as Southall and Twyford) may be able to amend it; if they can, I hope they will.

There seems to have been about 3 p.m., *i.e.* shortly after the hour of maximum temperature, an almost simultaneous outburst of electric action at a variety of points, between the parallels of 51° and 52° north latitude, and extending right across England. It would be of surpassing interest to find these foci, and trace the onward course of each storm, but the task is almost too great; I therefore confine my narrative to those traversing the part of the country shown in the accompanying map.

The first storm seems to have formed between Windsor and Guildford soon after 1 p.m., and moved slowly to the N. until it reached the Thames

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near Egham, when it appears to have divided, one portion passing up the river to Windsor, and the other down it over Hampton, Richmond, and Isleworth—that is to say, in a north-easterly direction. An unexplained and difficult fact is, that at Gomer House, Teddington, and at Richmond the storm is reported to have come from the E.; if so, how are we to reconcile it with the facts that half Richmond Park was dry and dusty, and that the observer at Spring Grove, who (on the assumption of an E. to W. motion) should have had the brunt of the storm did not, only registered 0·04 in. of rain, and accompanied his report with a map shewing S.S.W. to N.N.E. motion?

Evidence is wanting as to what occurred in the neighbourhood of Acton, but I am inclined to think it there met the Cricklewood storm (so called for distinction) was overborne by it, and carried back to Egham by about 4 or 5 p.m.

The boundaries of the Cricklewood storm having been described, it remains only to state that the storm appears to have been formed in Upper Holloway, to have skirted the southern side of Highgate Hill, then across Hampstead Village, and Child's Hill, on to Cricklewood where *alone* violent wind was felt, a fine poplar, being broken short off, and the road strewed with branches and twigs; I have not traced it much further to the west, but believe the suggestion previously offered is the most probable.

Some of our great authorities on wind have urged the existence of vertical rotary motion—(*i.e.* if a cyclone under ordinary circumstances is represented by a wheel revolving while lying on its side, a vertical cyclone would be represented by the same wheel revolving in its proper position on the axle of a carriage.) I have mentioned this because it seems to me the readiest solution of a puzzling fact, namely, that the largest hailstones did not do most mischief. Doubtless this was partly due to the relative hardness of the stones, but it was not *wholly* this, as many of the larger stones at Hampstead were of the hard species, yet the damage there was trifling, as it was also beyond Cricklewood, although the hail was large and hard, they fell "quite gentle like," as a native told me at Willesden Green. Now supposing (for it is only a bit of theory) there was such a vertical cyclone, its rotation being such that the motion of its lower half was in the same direction as the general course of the storm, it would solve at once several difficulties; thus—let its lowest portion be assumed to have swept near the surface while crossing over Cricklewood, it would then give wind force sufficient to break the poplar, and by increasing the velocity of the hailstones would produce equal or greater destructive power than where they fell without the wind and yet were larger; moreover, *if* this theory be accepted, it will also explain how large and heavy hailstones could fall "quite gentle like" a mile or two further on, for there the upward motion of the lower advancing quadrant of the cyclone would, by its tendency to lift the stones, partly counteract the force of gravity and so let them fall "quite gentle like" to the earth.

It only remains for me to thank those who have so kindly assisted

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me in examining these storms and to subjoin abstracts of their letters which are more interesting than anything I could add.*

NOTES ON THE STORMS OF JUNE 27TH, 1866.

ABBREVIATIONS.—T for Thunder; L for Lightning; T S for Thunderstorm; H for Hail; R for Rain

MIDDLESEX.

SHORTWOOD HOUSE, STAINES.—Clear and warm till 2 p.m., when T S rose in S.W. opposite the wind, and seemed (when over the western part of Surrey) to divide, part taking the course of the Surrey Hills to the south of the Thames towards Kent —and part stretching towards Bucks and taking the hills to the north of the Thames valley, eastward towards Essex. At Staines we received the flank operation of both and escaped the full brunt of either, but having of course some T L and R as the clouds passed over—after a while the storm travelled back to the W. and continued rattling round Staines at intervals till 8 p.m. Total rainfall 0·47 inches.

CAMBRIDGE HOUSE, HAMPTON WICK.—Severe T S with H between 2 and 3 p.m. It commenced with wind N.N.E., then N.E., and E.N.E. (it came from E.N.E.); during its continuance wind shifted to W.N.W., storm following it; this took it over Teddington and Hounslow; storm went off about W.S.W.; wind changed suddenly at 4 to N.E.

THE GROVE, HAMPTON WICK.—T S passed over here from S.E. to N.W. in great violence between 2 and 3 p.m.; hail as large as marbles. Total R=0·18 in.

HAMPTON WICK.—Severe T S and heavy R from 2 to 5 p.m.

HAMPTON COURT.—Heavy T S with H 0·3 or 0·4 in. diameter, between 1.30 and 2 p.m., seemed to come over the Mitre Hotel [? from S.]

HAMPTON COURT.—Very violent T S from 1.30 to 2 p.m. H of all sizes from 0·1 to nearly 1·5 in. diameter (almost as large as hen's eggs) like broken pieces of ice. R fell in sheets.

HAMPTON COURT.—Violent T S between 1 and 2, hailstones mixed with large pieces of ice were 0·5 in. diameter.

BUSHEY PARK.—L struck one of the chestnut trees, heavy H fell, and the roads were flooded.

TEDDINGTON.—Very large H 0·6 in. diameter, some hard and clear like ice (these were occasionally depressed in the middle, thus ∞ [? two frozen together]); others were soft and opaque like snowballs.

GOMER HOUSE, TEDDINGTON.—Dark cloud appeared in S.E. about noon, but did not rise rapidly. Suddenly about 1 p.m. a mass of cloud overspread the zenith, quite as if newly formed there, moving rapidly and spirally; this joined the rising thundercloud, and some *very heavy* drops of R fell spreading on the stones to the size of a crown-piece. "I fear we shall have electric hail," I said to a friend, and in five minutes we did. The R thickened, but decreased in size, and a hailstone came down here and there, but soft, and of moderate size. Meanwhile the L was very vivid, and the T almost simultaneous. At 1.15 the size of the H suddenly increased, the average size and shape being that of acidulated drops, and of clear ice; but among them, here and there, at intervals of 2 or 3 yards amorphous blocks of ice, 0·5 or 0·6 in. across. There was not much wind, and the H and floods of R were driving from E, when suddenly at 1.30 another fall cut right across it, thus X, and presently all the pour was more strongly inclined from the W. than it had been from the E. At 2.30, the storm went away to W. and N., returning in a feeble manner at 4 and 7 p.m. Some glass broken, and trees knocked about.

TWICKENHAM HOUSE.—At 1.40, the R was too dense to see across the lawn, and the garden was flooded—very little, if any hail.

TWICKENHAM OBSERVATORY.—Violent T S from 1.30 to 3 p.m., with R and then H. Total R ·36 in. Wind E.

SPRING GROVE (between Hounslow and Isleworth).—Between 1 and 2 p.m. a T S worked down the Thames Valley over Twickenham, Richmond, and Brentford, when at the last-mentioned place it appeared to be met by a counter-current, and

* Additional information will be found on pages 55 & 56, in the notes of the regular contributors to the monthly table.

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driven back. Only 0·04 in. of R fell here, and that was just after the above-mentioned retrogression.

HAMMERSMITH.—Heavy showers between 2 and 3 p.m., the drops of R being of remarkable size. Wind E., and some T in the N.

NIDDRY LODGE, KENSINGTON.—At about 4.30 p.m. I noticed an appearance which I pointed out as a small waterspout. It was a funnel-shaped cloud in rapid motion, but too far off to distinguish rotation. It seemed to break and rise into a heavy cloud. The direction was N. by W. (true), the altitude about 20° above the horizon, and the apparent length of the funnel about 5° when longest. It only lasted a few seconds, say 30, and was seen through a gap in clouds which were moving very slowly westward.

OAKINGTON, WEMBLY.—Heavy R in one hay-field, and at the rick to which the hay was being carried (400 yards off) none at all. T S seemed to come from S.E.

WILLESDEN.—Heavy R but little or no H. The R appeared to have fallen from a point 10° E. of the zenith—*i. e.*, nearly perpendicularly, and therefore there can have been no wind there.

WILLESDEN GREEN.—Heavy R and large H but it fell "quite gentle like."

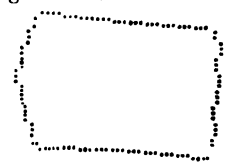
KENSAL GREEN.—Roads flooded by the heavy R.

HARLESDEN GREEN.—Very heavy R, but little or no H.

CRICKLEWOOD.—Storm swept down from Hampstead about 3.15, and for 5 or 10 minutes was very alarming; it fell most violently to the S. of the village between the Windmill Inn and Shoot-up Hill toll-gate. A violent rush of wind from N.E. snapped off a poplar 10 or 12 inches in diameter and strewed the road with twigs and small branches; the H broke a large number of windows, 9 panes in one, 10 in another, 14 in another, and lesser numbers in several others.

SHOOT-UP HILL.—"Being on Shoot-up Hill at a quarter-past 3 yesterday in my trap, the hail fell so heavily the turnpike man would not come out to take his toll of me, and I passed through without paying. It was very dark, and, though I have been 70 years in the world, I never saw such a sight before."

CHILD'S HILL, HAMPSTEAD.—Sudden and *sharp* H storm at 3 p.m., for 10 minutes, stones very large. The accompanying outline is reproduced from a line traced round one after it had partially melted; it must have been quite 1¼ in. by 1 in. It was not icy but like hardened snow. It rained in torrents.



FERN LODGE, HAMPSTEAD (near Jack Straw's Castle).—At 3 p.m. a very heavy hailstorm from N.E., lasting 5 minutes. Ten minutes after the storm, and when the hailstones had melted considerably, several measured more than ·7 in. diameter. They did not, however, fall violently, and only broke a few squares of greenhouse glass. The sun was shining brightly 3 out of the 5 minutes the storm lasted.

MOUNT GROVE, HAMPSTEAD.—Chiefly heavy R, but H whitened the grass. *No wind*, and R and H fell almost perpendicularly; no glass broken. Stones pear-shaped, the two diameters being often ·5 and ·3. In many the small end was clear ice, and the other end opaque—or there was a sort of nucleus or lagoon of clear ice surrounded by radiating striæ, some were granulated like sago pudding, with an opaque nucleus in the centre of each clear granule. R lasted about 20 minutes, and=0·30 in. Southern half of sky cloudless. Two or three hundred yards N. of us a good deal of glass was broken. T S appeared to move in an easterly current.

ROSLYN, HAMPSTEAD.—Heavy T S from N.E. between 3 and 3.20 p.m. Loud T, and hailstones 0·6 in. diameter. R to the depth of 0·33 in.

MILITIA BARRACKS, HAMPSTEAD.—At 3.15 p.m. T, hailstones 0·6 in. diameter, but no glass broken. The R very heavy, and very large drops.

34, ADELAIDE ROAD, N.W.—Heavy R at 2.50 from N.E. for about 10 minutes—very large drops.

COLLEGE ROAD, ADELAIDE ROAD (200 yards from Chalk Farm Station).—Sharp R for about 20 minutes; H 0·65 in. diameter, but only lasted 5 minutes.

GOSPEL OAK FIELDS, KENTISH TOWN.—H nearly an inch in diameter. [?]

MALDON ROAD, HAVERSTOCK HILL.—About 3 p.m. a most extraordinary shower of H. Three panes broken facing N.E.

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ST. ALBAN'S VILLAS, HIGHGATE ROAD (Upper Kentish Town).—Storm came up from E. ; H about 0·7 in. diameter, broke one pane in skylight ; not much R.

HIGHGATE NURSERIES.—No storm on 27th ; a little R at night amounting to 0·05 in.

SOUTH GROVE, HIGHGATE.—Violent H storm from 2.30 to 3 p.m. ; H nearly an inch in diameter ; measured one 2 or 3 minutes after its fall, and even then 0·75 in. square.

OXNEY VILLAS, ST. JOHN'S ROAD, UPPER HOLLOWAY (250 yards E. of Highgate Archway Tavern).—H 0·2 in. diameter, but was half melted. There seemed to be a T S in the S.W. at the time.

YORK ROAD, UPPER HOLLOWAY.—About 3 p.m. some claps of T, and for 5 minutes a few hailstones, the size of marbles, quite round and smooth.

TREDEGAR SQUARE, BOW ROAD, E.—A short, but very heavy R about 2 p.m., no H, but very large drops of R. Sky clear in N.E.

WHETSTONE.—At 2.45 p.m. I saw the clouds rising in one continuous line from S. to N., but when they had nearly reached the position where I was standing in Totteridge-lane, to my great surprise the whole body of them veered in the same straight line towards the E.—*i. e.*, moved eastwards parallel to their first position, remaining still in a line S. to N., they would cross the districts you mentioned in the *Times* of 28th, about 3 p.m. No R or H fell here at the time, but between 5.30 and 6, for a good quarter of an hour, R poured down in torrents, so saturating our roads that notwithstanding the heat, wind, and sunshine of 28th, there were no signs of dust until 29th.

[This communication is somewhat irreconcilable with the fact that all the glass broken in the Cricklewood storm either there or at Hampstead, is reported to face N.E. or E.; if the storm-cloud moved to the E., it would surely break the glass facing the W., not the E. and N.E., as was the case without any exception of which I have yet heard.—ED.]

SURREY.

GUILDFORD.—About 1.30 p.m., a very dense cloud formed over Ash, Aldershot, and Farnham, apparently the centre of a T S.—R very partial ; in places very heavy ; and 10 yards off not a drop.

COBHAM LODGE.—T S about 2 p.m., but no rain ; the L struck a chimney at the White Lion Hotel, Cobham-street, and passed through the parlour into the kitchen below ; the storm passed off in the direction of Weybridge, where they are said to have had hail as large as walnuts.

COBHAM.—T S about 2 p.m. with H. 0·2 to 0·5 in. diameter. It came from S.E. and passed on to W. and N. Total R = 0·17 in.

BAGSHOT (2 miles N.E. of) a tree struck by L.

BAGSHOT PARK.—Slight rain (not enough to measure) about 6 p.m. This high table land is generally very exempt from local storms.

DUKE'S HILL, BAGSHOT.—About 1.15 p.m. T in N.E., whence it moved in a circular direction S. and W. until it appeared to be over Aldershot. Thence it appeared to take a N.W. course (still circling round without approaching us), to the direction of Windsor where it appeared to rage furiously, the T being almost incessant from 2.30 to 4, when it became more distant and only continued at intervals until a few minutes past 6, when a T S bore suddenly down upon us from the W. and raged violently for half-an-hour. Rain only fell during this storm, and it amounted to 0·22 in.

EGHAM.—"During the severe storm on Wednesday afternoon, between 5 and 6 o'clock, the electric fluid struck the telegraph wires at the railway station, and entered the office, when a terrific explosion took place, which completely demolished both instruments. Happily no one was near at the moment, otherwise serious consequences might have ensued. Mr. Clay, the station-master, and Mr. Channing, were standing by the entrance, and were for the moment stunned. The hail-stones which fell in the neighbourhood of Thorpe and Stroud were of immense size and did considerable damage to the garden lights and greenhouses, also destroying quantities of fruit and vegetables."—*County Times.*

EGHAM, (1 mile S.S.E. of.)—Distant T at 0.30 p.m., R began at 1.45, heavy shower at 3. Violent T S from 3.55 to 4.10. At 4.0, H 0·5 in. diameter and a

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deluge of R. Notwithstanding the oppressive heat and the amount of R, it was more than an hour before all the H was melted. At 5.45 another T S. Hay laid and corn bruised.

PARKSIDE.—T S, H and heavy R from 2.30 to 4.40 p.m. Passed from S.E. to W.

ENGLEFIELD GREEN. (4 miles S. of Windsor.)—T and heavy R but no H.

CUMBERLAND LODGE, WINDSOR PARK.—T S at intervals from 3 to 8 p.m., H & R very heavy for half-an-hour. R to 9 a.m. 28th 0·70 in. Mangold wurzel leaves pierced by the H.

NORFOLK FARM. (1 mile from Cumberland Lodge.)—Many panes of glass broken.

ESHER.—Heavy R, but no H. No R 2 miles S.E. of this place.

CLAREMONT.—Heavy R, but no H.

RICHMOND.—From 1·30 to 2 p.m. H 0·4 in. by 0·25 in.

RICHMOND.—Hailstones 0·6 in. diameter.

RICHMOND.—Very large hailstones; plants much damaged, but no glass broken.

RICHMOND.—At 1.15 p.m. T S and very heavy R, H at 2 p.m. for 5 minutes from the E., diameter 0·25 to 0·30. The R at 1.15 was like tropical R, and quite perpendicular. The L struck the schoolhouse, but only loosened some stones—it crossed from one gable to the other without entering the building.

ST. MARGARET'S, RICHMOND. (On left bank of Thames, near the Railway Bridge.)—Between 2 and 3 p.m. very heavy R, with large H, many stones ·5 in. diameter, but no glass broken.

KEW OBSERVATORY.—Soon after 1 p.m. a heavy T S burst over this neighbourhood, with heavy R, and unusually large hailstones. Distant T throughout the afternoon. Total R = 0·26 in.

PUTNEY.—Much very loud T, but only a few enormously large drops of R.

MORTLAKE.—Heavy T and H the latter 0·5 in diameter and quite icy.

NASSAU SCHOOL, BARNES.—From 2.15 to 2.30 p.m. H 0·5 in. diameter shaped like a champignon without the stalk.

BERKSHIRE.

ROYAL MILITARY COLLEGE, SANDHURST.—Two T SS passed over here, the first at 3 p.m., from S.E. to N.W., the second between 5 and 6 p.m., from N. to S.W. Total R = 0·16 in.

WINDSOR.—T S, hailstones 0·4 in. diameter came from N.

WOODSIDE, OLD WINDSOR.—Three separate T SS; the first from 1 to 2 p.m., the second 5 to 6 p.m., and the third later in the evening, all came from E.S.E.; very little H and no damage; R to 9 a.m., 28th, 0·37 in.

CLEWER, NEAR WINDSOR.—Much glass broken by the H.

BINFIELD, BRACKNELL.—The first storm broke about 2.30 and lasted about 40 minutes, wind S.E. H very heavy and some stones an inch long; a little glass broken in greenhouses, as there was no wind, dwelling houses escaped. At 4.30 the barometer was falling rapidly, about 5 the wind chopped round to N.W. and the storm came back, the clouds twisting and turning in the most extraordinary manner. At 5.40 R commenced and by 6 the storm was awful. Nothing equalled it that I ever saw or heard (since the 27th May 1841). The L was incessant and there was no appreciable interval between it and the T. A few minutes after 6 the H commenced and in a short time the ground was covered with H stones and lumps of rugged ice; they varied in size from that of a large marble to a large-sized walnut. I was told ice had been picked up more than 2 inches long, I myself saw stones fully 1 inch in diameter—the shape was peculiar, like acid drops, the longer axis ¾ to 1¼ inches and the shorter ½ to ¾ inch, there was a darkish spot in the centre from which radiated lines towards the circumference. At 6.10, while watching the vane, the wind went round with a roar to S.E., and for a few moments a high wind added to the fury of the storm. For about ten minutes the turmoil was indescribable: roads, gravel paths, &c., were hurried away with leaves, plants and flowers, and the desolation caused in gardens was very great. The storm moderated at 6.50, the wind went back to W., and at 7 the storm ceased. It was felt in most of the adjoining parishes, but not in all, and the area of destruction, of which the church is the centre, was very small (about ¾ of a mile by ¼ a mile); within it, however, upwards of 2000 panes of greenhouse and hothouse lights were broken. To give some idea of the force of the H, I may mention that I found the flower-beds pitted with

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small holes, at the bottom of which were leaves and stalks of geraniums and other plants. The H lay thick on the ground next morning in shady places. Very little damage done to dwelling houses, except from water which made a clean sweep through some, and seriously injured others.

READING.—T S from S.S.E., commencing with heavy H at 3.15 p.m.; main body of T S passed south of this, but part seemed to go N. and rejoin the main body in the W. High wind from S.S.E. Storm over at 5.30.

ROUND OAK, GREENHAM, NEWBURY.—Sunshiny forenoon, T S, and heavy R from 1 to 1.20, hot sun and very close from 1.20 to 3.30, heavy R 3.30 to 6, fine again till 7.40, R from 7.40 till 8.45, fine and moonlight afterwards—total R, 1·70 in. The storm seemed to work round here, with no wind to blow it away.

LAMBORNE, HUNGERFORD.—The TS began at 4.30 p.m., H from 5.45 to 6, breaking many windows and hundreds of greenhouse panes. The hailstones were mostly flattened ellipsoids, principal diameter over 0·75 in. smaller diameter 0·5. It was the most violent T S for many years. Acres of young turnips and swedes were ploughed up and washed away by the H and R.

CHALLOW STATION TO LAMBORNE.—Found that no H fell except in Lamborne. but the R extended over the downs into the Vale of the White Horse.

KENT.

BIDDENDEN, STAPLEHURST.—The 27th was beautifully fine, but the barometer fell steadily; very heavy T clouds appeared in S.S.W. about 7 p.m., and at about 8 p.m. we had a T S, and a good deal of R, the T S apparently came up from the sea about 20 miles off and passed away to N.N.E.; it did not last more than half-an-hour.

FOLKESTONE.—At 3 p.m. a heavy H storm (H stones about 0·4 in diameter) with T. Storm lasted about 20 minutes; what little wind there was, was from E.N.E.

PAVILION, FOLKESTONE.—About 4 p.m. one loud clap of T preceded a shower of R and H (of the usual size). Clouds had been gathering about an hour; the R was general and highly beneficial in this district, and continued the whole evening; no wind, and the sea like a mirror.

SUSSEX.

STEYNING.—On 27th a dense nimbus cloud passed over in a current from N.E. to S.W., and commenced discharging rain and hail, accompanied by vivid lightning and loud thunder at about 3.30 p.m. At 3.45 p.m. when it ceased, the lawn was white with hailstones, many of them of large size, oval in shape, $\frac{3}{4}$-inch × $\frac{1}{2}$-inch (the major axis of one was certainly $\frac{3}{4}$-inch), and my rain-gauge registered 0·23 inch of rain during the brief quarter-of-an-hour of the storm. The thermometer in shade fell from 80° before to 67° after the storm. The barometer having fallen, previously stood at 29·84 (uncorrected). There was scarcely any wind. The storm was very partial. At a place one mile N. of us there was no rain, and no heavy rain beyond a line half-a-mile to the E.S.E., which seems to mark a comparatively narrow band of rainfall; yet, within the line it was severe, as 80 small panes of glass were broken at the Vicarage; our own glass being stouter, escaped breakage. I do not hear of any glass in dwellings being broken, but sky-lights may have suffered. The character of the storm was notable from its suddenness: many clouds of the cumulus character had passed over previously, and gathered in the W.S.W., beneath an over-spreading canopy which was nearly stationary all day; at length, a denser gathering of cumulus came up from the N.E., but without discharge until its south-western limit fell under the verge of the upper canopy when it broke slightly N.W. of this town, and soon in a perfect deluge over us.

HAMPSHIRE.

MILLAND HOUSE, LIPHOOK, HASLEMERE.—Signs of an approaching T S about 2 p.m. but no R till 2.30 when one or two showers fell; the main T S did not, however, pass over here.

WAINSFORD, LYMINGTON.—Between 1 and 2 p.m. a T S came from the E. up the Solent as far as Southampton Water; it then divided, part went along south of the Isle of Wight, the rest up Southampton Water into the New Forest, the L was frequent and T loud, I should think the T S was severe at Southampton; we

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only had the extreme edge of it, the total R being only 0·02 inches. The New Forest together with Southampton Water appears to attract all the storms whether E. or W., and they rarely come here.

HERTFORDSHIRE.

HITCHIN.—Smart T S about 3 p.m. for 10 minutes. It was most curiously local, the men in one part of a field complained of R while those in the other had bright sunshine and no R. The roads shewed the same, in one part streaming with R, in another the dust lay thick and undisturbed.

ESSEX.

CHIGWELL.—At 10 p.m two or three very loud claps of T, with a little R; a tree struck in the neighbourhood.

DEBDEN GREEN, LOUGHTON.—This place was skirted by a T S last evening, the clouds being of a singular form. A few minutes after 10, L began in the neighbourhood of Epping, but it did not come very near here.

WILTSHIRE.

HIGHWORTH, SWINDON.—Clear on 27th up to about 5 p.m., wind E.N.E. Clouds came up chiefly from the wind, and at a little before 6 lightning began. The fall commenced about 6 p.m., and was exceedingly heavy; the stones were, so far as I saw, mostly of the shape of truncated cones, about ⅜ths-of-an-inch at bottom and and 3-16ths at top, and perhaps ½ inch or less high. The hail was soon over, but rain continued for about an hour. I drove out about 7.30, and while driving saw several thunder-clouds and much lightning. The clouds seemed to go in two directions—one about 4 miles to the west seemed to be going W.N.W., while one about 4 miles to the south seemed going westward. I saw rain falling from both up to near 9 when I returned. The sky was clear at 10. I found ·72 (seventy-two) in my gauge this morning, and I expect there was a good deal splashed over, especially at first, and probably but little hail was caught.

LANDFORD (9 miles S.E. of Salisbury).—About 3 p.m. T L; heavy R and large H; R at intervals to 7 p.m. = ·60 in. I hear that 3 miles off they were carrying hay all the time.

TROWBRIDGE.—T S and R amounting to 0·12 inch.

WESTBURY.—Streets are said to have been deluged with rain.

SOMERSET.

FROME.—Heavy R for two hours.

YEOVIL.—At 3.30 p.m. violent T S. R at first in very large drops, afterward almost in sheets; no H.

BATH.—This city was visited by a very heavy T S between 5 and 6.45 p.m. In less than an hour ·81 in. of rain fell; L exceedingly vivid.

BATHEASTON.—Very heavy T S began about 5.35 and R was very heavy for 2 hours—H said to have been as large as an acidulated drop—I picked up some as large as a good sized pea.

DORSET.

CHALBURY, WIMBOURNE.—A T S began here soon after 2 p.m. and lasted till 3.30, a little H about 3 p.m., about 0·4 in diameter—total R, 0·47 in.

GLOUCESTERSHIRE.

MONTPELIER, BRISTOL.—Very violent storm, the R here amounted to 1·12 in.

CLIFTON, BRISTOL.—The great heat of the last two days (84° 25th and 83° 26th) has been succeeded this afternoon (Wednesday, June 27th) by the most severe thunderstorm experienced here during several years.

Even before noon, to-day, suspicious-looking masses of cumulus cloud were observed to be gradually overspreading the eastern portion of the sky. By 3 p.m. it became evident that a thunderstorm was imminent, and shortly afterwards some distant growls, with a few drops of falling rain, indicated that the storm had commenced within no great distance. These threatenings, however, passed off in a measure, and it was not until 5 p.m. that the gathering of heavy masses of cloud in the south-east betokened the near approach of a considerable storm. About 5.20 a peal of thunder was heard, and from this time till 7.40—an interval of 2 hours and 20 minutes—flashes of lightning and peals of thunder succeeded each other with

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a rapidity not often witnessed. At least a hundred flashes were observed; between 50 and 60 were actually recorded. The storm probably extended over a large area, but at all events this district was completely enveloped by it, the focus of electrical disturbance appearing successively at almost every point of the compass. Some localities, however, seemed to be specially selected as points for electrical discharges. For example, between 6.12 and 6.24 p.m. an extraordinary number of flashes appeared to strike the earth at points from two to five miles distant in the N.W. It would not be surprising if accounts were received of damage in that direction. From 6.45 p.m. and during the remainder of the storm, the lightning was chiefly in S.E., a large number of the flashes being from 2 to 3 miles distant in that direction. Towards 8 p.m. the sky began to brighten in the north-west, and the heavy mass of clouds in the opposite quarter slowly sank towards the horizon. During the storm two flashes were especially near my place of observation—one at 5.48, in which the interval between the lightning and thunder was scarcely appreciable, the other at 7.33, in which the interval was about one second. The thunder on these occasions was very loud and crashing, though not so loud as is sometimes heard.

Many of the flashes were exceedingly brilliant and beautiful. A large number were vertical in direction, others were horizontal, or formed long jagged festoons across the sky. In several instances a flash was made up of three or four distinct discharges, but so nearly simultaneous that the lines of light combined to produce a single figure, which was often that of an arch touching the horizon at two distinct points. It is very rarely indeed that so excellent an opportunity occurs of studying the forms of lightning. A photographer might have secured the portraits of scores of flashes.

Rain fell to the amount of *eight-tenths of an inch*. Early in the storm hail-stones, 0·33 in. in diameter, fell thickly for a short time.—GEORGE F. BURDER, M.D.

CASUALTIES IN BRISTOL FROM THE THUNDERSTORM.

The heavy thunderstorm of last evening has done some damage in the city. The vast quantity of water which poured through the thoroughfares tore up gravel and stones, and on St. Michael's Hill, the avenues leading to Kingsdown and other hill sides, the soil from gardens and the gravel from the streets were carried down with the stream and deposited on the first levels.

At half-past five a man named Charles Abraham, residing in Castle Court, Temple Street, and in the employ of Mr. Baker, contractor, was riding a horse at the bottom of Clare Street. The lightning struck a saw which he carried in his hand—and he was knocked off the horse. He was taken up insensible, and it was feared that he was dead: but on his being taken into the shop of Mr. Sprackett, chemist and druggist, and attended to, his consciousness was restored, and he was carried home by some of his fellow-workmen. He appeared to be not much hurt.

In the Stapleton Road, the telegraph wire connected with the chimney of a dwelling-house was struck by the lightning. The wire was detached from the post by which it was fastened, and about three hundred yards of it fell almost to the ground. The occupier of the upper room of the house—a female—fainted at the occurrence.

Between five and six o'clock information was received at the various engine-houses that a fire had broken out on the premises of Mr. S. Jones, at the top of Stoke's Croft. The reels were at once manned, and away went the men through the pitiless storm. Upon their arrival it was found that the lightning had struck the chimney, causing a rent of some ten feet, from the chimney-pot to the roof. It had then evidently passed into one of the front bedrooms, and out through an open window. Fortunately no one was in the house at the time.

The lightning caused considerable damage to chimneys in various parts of the city, including a rather large one in Leek Lane; and a saw which was being carried by a man in the Pithay was damaged.

MONMOUTHSHIRE.

NEWPORT.—The T here was terribly grand and the L exceedingly vivid. The R and H was heavier than has been known for many years, and did a great deal of

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damage. In Dock Street hailstones fell of upwards of an inch and a quarter in diameter; one was picked up and measured, and its circumference was *four inches*. Square pieces of ice of *upwards of a pound weight each** were found in the neighbourhood of the Docks. High Street was overflowed, being a foot deep in water, and the cellars were in most cases filled. The cellars of Messrs. Davis, Bros., grocers, were filled with water, and goods were damaged to the extent of £250 or £300. Nearly all the garret windows in Dock Street have been broken. Strange to say, the country districts to the north-east of Newport, only some 2 or 3 miles distant, were not visited by the storm.

NEWPORT.—At half-past five o'clock a most frightful storm broke over this town, and lasted with the greatest severity for about one hour. The rain descended so thick and with such velocity that the spray from it was like the spray of mighty waves dashing against each other. Hailstones, or rather large lumps of ice, fell of considerable size, and some of them were picked up weighing at least a couple of ounces. The lightning was excessively vivid, and the thunder was close and heavy; in fact, it resembled the discharging of a large park of heavy artillery. The damage done to the standing crops and other property must be immense.

GLAMORGANSHIRE.

TYNANT, PENTYRCH.—The T S extended over a long tract of country, reaching to Bristol and Newport on the east, and thunder was heard as far as Neath in the west. The weather was intensely hot, and the storm at Pentyrch commenced with great suddenness at 5 p.m. Rain fell in sheets, and ran in rivulets from the hill-sides; in a little more than half-an-hour it amounted to 0·68. It was accompanied by hail of large size and various shapes, some round, others oblong, and some of them were irregularly-shaped masses of ice, quite clear like glass. The greatest diameter of any of them was half-an-inch. Many buildings were struck by the lightning, and a few cattle were killed, but no human being injured. The hail did some damage to the standing corn. Over the area I have mentioned there were several centres of intensified electric disturbance, of which Newport appears to have been the chief in severity.

SIMPLE BAROMETRIC FORMULÆ.

IT will not probably be thought surprising that the letter of "A Lazy Man" has elicited several replies; from them we select three, illustrating varieties of method, inserting them in the order of their receipt.

June 19th, 1866.

SIR,—If your correspondent, "A Lazy Man," will purchase Negretti & Zambra's "Treatise on Meteorological Instruments," (price 5s.), he will find at p. 56 a rule laid down, that for measuring heights not exceeding many hundred feet above the sea level, by means of the aneroid, this simple method will suffice—"Divide the difference between the aneroid readings at the lower and upper stations by ·0011, the quotient will give the approximate height in feet," and at the same page he will find out (by an example given, and actually worked out; and with reference to certain tables *contained in the same work*) how to deal with cases where greater heights are concerned and greater accuracy is required—and he will ascertain that what he requires can be easily attained without reverting either to rule-of-three or logarithms.—I am, Sir, your obedient Servant,

A. K. C.

SIR,—In answer to the letter of "A Lazy Man," in the last number of your Magazine, I take the liberty of informing him that I have for many years amused myself with barometrical measurements. When I have had no object in view but amusement, I have contented myself with calculating according to a scale engraved on one of Sir Henry Englefield's portable barometers. That scale is as follows:—

* Surely an exaggeration; they would have been 3-inch cubes, or spheres about a foot in circumference.

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When the quicksilver stands at	ft.		ft.
31·0 inches, ·1 of an inch answers to	84	27·75 inches, ·1 of an inch answers to	94
30·3 ,, ,, ,, ,, ,,	86	27·15 ,, ,, ,, ,, ,,	96
29·6 ,, ,, ,, ,, ,,	88	26·55 ,, ,, ,, ,, ,,	98
28·95 ,, ,, ,, ,, ,,	90	26·00 ,, ,, ,, ,, ,,	100
28·35 ,, ,, ,, ,, ,,	92		

If this scale be right, your correspondent would be wrong if he adopted the idea that the tenth of an inch represented 100 feet in altitude at whatever height the quicksilver stood in the barometer.—Believe me, thankfully yours, W. S. H.

11, Offord Road, N., 20*th June*, 1866.

DEAR SIR,—A correspondent of your *Meteorological Magazine* requires a simple rule for calculating heights from the readings of an aneroid. I think the one which I now send you will suit his purpose. It will give, within 20 feet, the elevation of hills not exceeding a quarter of a mile in height.

RULE :—Read the aneroid to the nearest hundredth of an inch; subtract the reading at the upper station from that at the lower, leaving out, or neglecting, the decimal point; multiply the difference by 9; the product is the elevation in feet.

Example :—Lower station ... . 30·25 inches.
Upper ,, ... 29·02
123
9
Elevation .... 1107 feet.

Your's respectfully,
R. STRACHAN.

We cannot but think our self-styled "lazy" friend will be gratified with the above letters—especially Mr. Strachan's, which is temptingly easy, and, though we believe at high temperatures not quite so accurate as he assumes, it is sufficiently so for ordinary purposes, and is the very embodiment of simplicity. The following table we constructed for our own use in cases of small altitudes and where extreme accuracy was not necessary.

Mean of Barometer at two Stations.	Mean temperature.		
	25°	50°	75°
inches.			
27	·00104	·00099	·00094
28	·00108	·00103	·00098
29	·00112	·00107	·00102
30	·00115	·00110	·00105

RULE :—Take from the table the value corresponding to the approximate *mean* of the upper and lower barometers, and to the mean temperature (which may be guessed at) and divide the difference of the barometers by it, the quotient will be the height in feet.

Example :—Base of Ben Lomond..... 29·890 — Mean temperature 50°
Summit of ,, ... 26·656 — Mean barometer 28·27
Difference .... 3·234

·00104)3·234(3110 = height in feet.
312
114
104
100
104
— 4

The true height being 3116 ft.
The above rule gives 3110 ft.
And the error is..... 6 ft.

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RAINFALL IN JUNE, 1866.

Div		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground ft.	in.	Above Sea Level. feet.	Depth of Rain. Total Fall. inches.	Difference from average 1860–5 inches.	Greatest Fall in 24 hours. Depth. inches.	Date.	Days on which ·01 or more fell.
I.	ENGLAND.	Camden Town	0	6	100	3·98	+ ·94	1·33	30	12
II.		Staplehurst (Linton Park)	0	6	200 ?	3·40	+ ·66	·98	4	9
,,		Selborne (The Wakes)	4	0	500 ?	2·84	— ·39	·47	5	12
III.		Hitchen	2	0	240	2·61	— ·03	·61	1	14
,,		Banbury	7	0	345	2·46	— ·81	·70	1	15
,,		Wisbech	0	6	10	2·50	...	·74	4	13
IV.		Bury St. Edmunds (Culford)	1	2	...	3·42	+ ·84	1·25	4	10
V.		Calne	0	11	250	3·02	...	·79	30	13
,,		Plymouth (Goodamoor)	0	2	580	2·94	—2·21	·76	18	18
,,		Barnstaple	0	6	31	2·48	—1·64	·51	6	13
,,		Taunton (Fulland's School)	1	4	...	·81	—2·06	·20	18	10
VI.		Shrewsbury (Highfield)	5	6	200	3·64	+ ·70	·61	12	12
,,		Tenbury (Orleton)	0	9	200	5·79	+2·27	2·65	1	20
VII.		Leicester (Wigston)	0	6	220	2·41	— ·35	·54	4	15
,,		West Retford	0	6	50	2·99	+ ·83	·65	18	17
,,		Derby	5	0	180	4·11	+1·22	·67	21	17
VIII.		Manchester	2	7	106	3·98	+ ·63	1·06	12	16
IX.		York	0	6	50	2·57	+ ·47	·58	19	16
,,		Skipton (Arncliffe)	3	0	750	3·46	— ·64	1·02	12	14
X.		North Shields	1	0	124	1·68	—1·06	·45	11	17
,,		Borrowdale (Seathwaite)	1	0	422	6·57	—3·94	1·55	21	18
XI.	WALES.	Abercarn	1	3	450	3·59	...	·77	4	13
,,		Haverfordwest	2	0	60	3·97	+ ·32	.91	21	15
,,		Rhayader (Cefnfaes)	2	0	880	3·87	— ·11	·86	1	16
,,		Llanberis (R. Victoria Hotel)	1	0	370	8·44	...	1·78	13	17
XII.	SCOTLAND.	Dumfries	0	5	70	1·84	—1·07	·51	30	13
,,		Hawick (Silverbut Hall)	4	0	512	1·27	...	·26	30	15
XIV.		Ayr (Auchendrane House)	2	3	94	2·17	—1·18	·37	12	12
XV.		Otter House	0	6	130	3·14	— ·70	·83	21	21
XVI.		Leven (Nookton)	0	6	80	1·35	— ·89	·52	20	12
,,		Stirling (Deanston)	0	0	130	2·58	— ·34	·82	20	12
,,		Logierait	1	0	250	1·64	...	·71	20	7
XVII.		Ballater	0	10	656	1·97	...	·52	20	10
,,		Aberdeen	4	8	115	1·45	...	·66	20	16
XVIII		Inverness (Culloden)	3	0	104	·63	...	·18	18	9
,,		Fort William	0	8	20	2·69	...	·65	30	18
,,		Portree	0	4	60	2·78	—2·00	·46	30	14
,,		Loch Broom	0	8	48	1·27	...	·28	16	15
XIX.		Helmsdale	1	0	34	2·12	...	·46	20	13
,,		Sandwick	2	0	78	1·87	+ ·34	·36	20	8
XX.	IRELAND.	Cork	6	0	65	4·27	...	·92	13	14
,,		Waterford	4	0	60	3·91	+ ·93	·64	11	17
,,		Killaloe	5	0	128	4·48	+ ·86	·82	17 & 18	20
XXI.		Portarlington	9	0	236	3·73	+ ·48	·57	4	21
,,		Monkstown	0	6	100	3·73	+1·12	1·14	18	17
XXII.		Galway	6	0	25	4·28	...	·61	5	22
,,		Bunninadden (Doo Castle)	1	0	...	4·61	...	·78	3	20
XXIII		Bawnboy (Owendoon)	1	3	218 ?	3·40	...	·46	20	21
,,		Waringstown	0	4	191	2·57	...	·47	12	15
,,		Strabane (Leckpatrick)	0	5	260	1·98	...	·27	20	19

+ Shows that the fall was above the average; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm.

ENGLAND.

CAMDEN TOWN.—High temperatures from 20th to 27th. Max. 86°·0 on 27th. T on 27th at 3 p.m., and three violent T SS on 30th, when R fell at the unusual rate of 4 inches per hour; this rate was only maintained for half-a-minute, but several times the rainfall was ·05 per minute.

LINTON PARK.—T(both near and distant) more prevalent than usual. TS unusually near on 22nd, 27th & 28th. Rain heavy and much above the average, while from the sunshine being much less, things are late, the wheat not being in ear till the 21st, the latest I have on record, except 1860 when it was one day later. Most things promise well. Greatest heat on 9th and 23rd.

SELBORNE.—T on 16th, 17th, 21st, and 27th at intervals all the afternoon, and at noon on the 30th. Max. 79°·0 on 28th; min. 38° on 17th: prevalent winds S.E. to S.W. Hail on 16th at 11·30 p.m.

HITCHIN.—The rain on the 27th fell about 3 p.m., during a storm very similar to that mentioned in the *Times*; it did not extend half-a-mile, and there was scarcely any cloud; it went in a S.W. direction. Tremendous T S on 30th.

BANBURY.—T SS on 1st and 16th, on which day an old oak tree was set on fire by the L at Wroxton Park, 2 miles from here. Max. 83°; min. 39°·5. Distant T S on 27th.

WISBECH.—T S at 3 a.m. and at 10 p.m on 4th, two horses killed during the latter storm; slight T S on 30th, at 4 p.m.

CULFORD.—A very severe T S on the 4th, with heavy rain and hail. Several accidents occurred; one fatal to a poor woman by the sick bed of her husband. A sharp hailstorm also on the 17th, lasting only a few minutes, but doing considerable damage. Weather warm, especially about the 10th, and during the last week. Max. 84° on.26th; min. 40° on 17th.

CALNE.—T S on 1st at 4 p.m., and 27th from 5 to 9 p.m.; fine and warm till 17th; intense heat from 21st.

GOODAMOOR.—Much distant T with great heat (but no rain) during the last week.

TAUNTON.—T S on 26th [27th ?], the storm breaking N.W. of the Vale of Taunton around Axbridge; hailstorm at 11 p.m. on 16th.

ORLETON.—T on 1st, 4th, 5th, 16th, and 27th; on the 30th loud T and much L.

WEST RETFORD.—T on 9th and 16th; T S distant in W. at 1 p.m., on 30th. With the exception of the 1st, this has been a pleasant and propitious month; the abundant rainfall, and the generally high range of temperature have brought on vegetation, but fruit trees suffered so much from the frosts of May that the produce (with the exception of apples) is most scanty. Temp. has been above 80° on 7 days. Max. 86° on 27th and 30th; min. 37° on 20th.

MANCHESTER.—Black bulb in vacuo. 141°·2 on 27th.

ARNCLIFFE.—The latter part of the month unusually sultry.

NORTH SHIELDS.—Lily of the valley in flower on 3rd. French rose on 9th. Grass cut on 25th. T on 19th.

SEATHWAITE.—First three weeks excessively cold, raw, and unseasonable. Last week unusually hot, only four days on which the rainfall exceeded ½-an-inch.

WALES.

ABERCARN.—T SS have been prevalent; there was a very severe one on the 27th at Newport 10 miles distant accompained by H stones as large as an egg causing much damage. The month has been comparatively dry, the latter part especially being hot, there having been eight cloudless days on which the temperature in the shade ranged about 80°.

HAVERFORDWEST.—It was wet and cold. Wet and chilly for the time of year till the 22nd, when a sudden change to warmer weather set in, which coming after

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the seasonable rain of the first three weeks had a most salutary effect on the hay crop much of which was cut and carried, during the last week. Corn crop and country generally looking well; for six days the heat was excessive. Max. 83°·5.

CEFNFAES.—T S with forked L from 5 to 8 p.m. on 27th in S. & S.E., on which day the temp. in shade was 92°. Cold till the 20th. Last eight days intensely hot.

SCOTLAND.

DUMFRIES.—Till the 24th the weather cold and ungenial; frosts on 16th and 17th, injuring the potatoes on damp soils; from the 24th very hot to the end of the month. On the afternoon of 30th heavy rain, very beneficial to the potatoes which are very bare and scorched. Fine weather at the close for haymaking, but the crop light.

SILVERBUT HALL, HAWICK.—The month, on the whole, has been warm and dry, although there were hail showers on the 15th and frost on the morning of the 19th, which in many instances blighted the potatoes, French beans, and dahlias. On the evening of the 24th the sky was singularly and beautifully dappled, which was followed on the 25th by a perfectly clear and cloudless sky. Thunder heard in the distance on the afternoon of the 29th.

AUCHENDRANE.—The drought of this month has been injurious to vegetation, (both the rainfall and the number of days on which it fell being below the average,) especially on light soils, and some kind of crops suffered severely from the unusual intensity of the cold from the 18th to the 20th inclusive, particularly during the night of the 19th. Max. at 78° on 25th and 26th; min. 32° on 19th.

OTTER HOUSE.—Very warm from the 22nd to 30th. Max. 79° on 26th; hail on the 19th.

NOOKTON.—Great heats, with much sun, and deficient moisture.

DEANSTON.—No thunder during the month. Max. 81° on 26th; min. 30°·3 on 19th. Sharp frosts on mornings of 18th, 19th, and 20th; potatoes much damaged.

LOGIERAIT.—The month opened with great warmth; on the 15th the temperature suddenly changed, till on the night of the 17th there was a keen frost, in many cases blackening the potatoes and injuring tender flowers. On the same night Ben Lawers was covered with a coating of snow—a circumstance reported not to have previously occurred at this season for upwards of 40 years. The close of the month hot, the temperature ranging from 75° to 80°. With the exception of hay, all the crops look well.

ABERDEEN.—T on 16th, 19th, 26th, and 27th. On the 11th, hailstones ⅛-of-an-inch in diameter, 24 picked up at random weighed 144 grains. Potatoes injured by frost on the nights of the 18th, 19th, and 20th.

PORTREE.—There were frosts on the 1st, 17th, 19th, and 20th, and heavy hail showers and squalls 16th and 17th. On the whole the month was very dry and warm; the pasture grass has suffered greatly from the heat and dryness. Swarms of worms from 2 to 3 inches long, something like caterpillers, have caused sad devastation in the grass in some parts of the island during this month; in some making the ground quite red, as if it had been ploughed. The cattle continue healthy.

LOCHBROOM.—We had every kind of weather but rain; in that respect it was a decidedly dry month; the heat at times was intense, yet on the 15th, 16th, and 17th it was bitterly cold, with hail and sleet below, and the hills covered with fresh snow to their base, yet, immediately after, we had scorching weather; the brooks and rivulets were never known to continue so long waterless—but welcome rain came at last.

SANDWICK.—June has been warm, dry, and bright; the last ten days were particularly warm. Wind 35 miles an hour on the 21st from midnight to 2 a.m.; several peals of thunder on the 27th and 30th.

IRELAND.

MONKSTOWN.—Much rain till the 21st, after which it was fine, and very much warmer. Crops good but not forward; hay generally a very heavy crop.

DOO CASTLE.—The rain came down in torrents at the beginning of the month, whereby vegetation was greatly promoted; turnips that had been sown since the 20th of May, and for more than a fortnight "made no sign," suddenly sprang into existence, contrary to all expectations. Tremendous hailstorm on the 16th;

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as far as I could ascertain, it was about a mile in breadth, and by the extent of the devastation it committed on the potatoe crops, &c., I traced it over 7 miles in length, and I doubt not it extended farther; birds were also found dead after it. This hailstorm did not come near the gauge. From the 21st to 30th, summer weather; T on 2nd and 12th.

OWENDOON.—Fine growth of grass, but tender plants, strawberries, &c., much retarded by the inclement weather of the first three weeks; on the 30th a tropical growth.

WARINGSTOWN.—Fine, genial month; making up in a great measure for our previously unfavourable spring; the last week was very hot, the intense sunshine raising the temperature of the soil 1 foot below the surface on several days as high as 67½°, or 1½° higher than at any time last year.

LECKPATRICK.—Fine month, the timely rainfall most useful to the crops. Max. 81° on 25th.

MINIMUM THERMOMETER ON GRASS.

Aberdeen, 3rd March, 1866.

MY DEAR SIR,—In your *Monthly Meteorological Magazine* for February, I see a letter on the exposure of the minimum for terrestrial radiation, and some remarks of yours with reference to that letter. I have been very much puzzled as to the best method of exposing the thermometers both for terrestrial and solar radiation, and as to the proper sort of thermometer to use. Hitherto I have used a Negretti and Zambra's maximum of the ordinary form completely exposed, and an ordinary spirit minimum on zinc frame, both with black bulbs. I have not been satisfied with the results. Early in January I procured a Negretti & Zambra's maximum (in vacuo), and one of their clear bulb minimum thermometers, and mounted them beside the other two. I read all four at 9 a.m. The two minimum thermometers "on grass" are less than four inches apart. The black bulb one is four inches from the *ground* (not the grass), and the clear bulb two inches from the ground. Therefore if either has a more advantageous position it is the one with transparent bulb. Instead of sending you the actual readings of each for the 45 days I have had them in operation side by side, I send you herewith the means for each group of 5 days. Except on 3 days the B. B. was always lower than the clear bulb, the greatest difference being on the morning of 1st March, 4°·5; but they had been under snow for nearly 24 hours at that time, the clear bulb being deeper imbedded.

The black bulb minimum thermometer on the grass seems therefore to be on the whole lower than the clear bulb minimum, and probably if I had the bulbs of both at exactly the same distance above the grass, the difference would have been greater.

I am very anxious to get information on the subject of terrestrial and solar radiation, but I have been unable to obtain any clear and intelligible instruction in any accessible books. You refer your readers to Mr. Glaisher's paper in the *Philosophical Transactions*, but what is a provincial to do who cannot procure that book.

I remain, my dear Sir, Yours, &c.,

G. J. SYMONS, ESQ. A. B.

Five day mean results of reading a black bulb minimum on the grass, and a transparent bulb minimum, placed side by side, both corrected for index error.

1866.	Black bulb min.	Clear bulb min.	Difference.	REMARKS.	
Jan. 16—20	32·24	33·08	0·84		Mean difference, 1·27
,, 21—25	32·02	33·18	1·16		
,, 26—30	32·12	33·78	1·66		
,, 31— 4 Feb.	29·06	30·90	1·84		
Feb. 5— 9	29·18	30·68	1·50		
,, 10—14	24·98	26·22	1·24		
,, 15—19	24·90	24·98	0·08	3 times in this period	
,, 20—24	26·94	28·38	1·44	clear B. above B. B.	
,, 25— 1 Mar.	25·02	26·72	1·70	2 days both buried in snow.	

N.B.—B.B. was compared by Mr. Buchan, Secretary of Scottish Meteorological Society, and clear bulb min. by Mr. Glaisher.

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Rainfall in each month from January to June, 1866, and comparison of the total fall in the six months, with the average of the corresponding period in the previous six years, 1860-65.

STATIONS.	Jan.	Feb.	Mar.	April.	May.	June.	Total.	Aver.	Diff.
	in.	in.	in.	in.	in.	in.	in.	in.	in.
England & Wales.									
Camden Town	3·90	3·72	1·69	1·76	2·03	3·98	17·08	11·82	+5·26
Linton Park.....	3·83	4·55	2·27	2·09	·81	3·40	16·95	12·26	+4·69
Selborne	6·23	5·47	2·72	2·78	1·56	2·84	21·60	14·80	+6·80
Hitchin.....	3·63	3·28	1·28	1·65	1·04	2·61	13·49	11·14	+2·35
Banbury	2·57	2·30	1·33	1·52	2·17	2·46	12·35	12·38	— ·03
Culford...	2·48	3·59	1·30	1·85	1·66	3·42	14·30	10·98	+3·32
Goodamoor	8·44	6·52	4·42	2·98	3·16	2·94	28·46	25·19	+3·27
Barnstaple	5·44	4·56	3·23	1·46	1·05	2·48	18·22	17·32	+ ·90
Taunton	5·15	4·05	3·44	1·91	1·64	·81	17·00	12·93	+4·07
Shrewsbury	2·40	2·18	1·42	·68	1·56	3·64	11·88	11·87	+ ·01
Orleton	3·00	3·02	2·31	1·69	·94	5·79	16·75	14·46	+2·29
Wigston	2·08	2·78	1·27	1·31	1·10	2·41	10·95	11·62	— ·67
W. Retford	1·25	2·25	1·22	1·27	1·07	2·99	10·05	10·05	·00
Derby	1·60	2·25	1·72	1·04	1·75	4·11	12·47	11·99	+ ·48
Manchester	3·25	2·98	2·17	·30	1·54	3·98	14·22	14·91	— ·69
York	1·64	2·50	1·35	1·05	·58	2·57	9·69	10·10	— ·41
Arncliffe	10·11	9·15	3·60	2·01	1·92	3·46	30·25	24·61	+5·64
N. Shields..... ..	1·51	1·78	2·47	1·47	1·14	1·68	10·05	12·68	—2·63
Seathwaite	25·99	19·17	13·05	5·97	5·06	6·57	75·81	68·09	+7·72
Haverfordwest	7·90	5·41	5·39	2·21	1·36	3·97	26·24	19·60	+6·64
Cefnfaes.....	7·42	6·03	3·93	1·33	1·18	3·87	23·76	20·07	+3·69
Average							19·59	17·09	+2·50
Scotland.									
Dumfries	5·56	3·00	2·03	·96	1·41	1·84	14·80	17·09	—2·29
Auchendrane	8·30	5·30	2·13	·77	1·94	2·17	20·61	20·29	+ ·32
Otter House	10·89	7·41	4·43	2·30	1·66	3·14	29·83	25·59	+4·24
Nookton	2·80	4·10	2·02	1·45	1·50	1·35	13·22	12·13	+1·09
Deanston	6·96	5·91	2·75	2·11	1·11	2·58	21·42	18·56	+2·86
Portree	19·17	10·90	6·40	3·80	1·95	2·78	45·00	48·05	—3·05
Sandwick	4·33	5·63	3·08	1·21	2·15	1·87	18·27	14·64	+3·63
Average							23·31	22·34	+ ·97
Ireland.									
Waterford.....	5·42	2·70	3·51	2·41	1·28	3·91	19·23	17·25	+1·98
Killaloe.....	6·63	5·51	3·85	2·05	3·06	4·48	25·58	21·02	+4·56
Portarlington	3·72	2·99	2·92	1·64	1·19	3·73	16·19	17·82	—1·63
Monkstown	2·59	2·30	4·15	2·11	1·58	3·73	16·46	13·77	+2·69
Average							19·37	17·47	+1·90

From the above table the following facts are evident:—

(1) In England and Wales the fall has been about 2½ in. above the average, say 15 per cent. in excess.

(2) In Scotland the fall has been about 1 in. above the average, say 4 per cent. in excess.

(3) In Ireland the fall seems to have been about 2 in. above the average, say 11 per cent. in excess.

(4) Speaking roundly, the rainfall of the past six months has been about one tenth part greater than usual; but in Middlesex, Kent, and Hampshire it has been nearly half as much again as usual—42 per cent. in excess.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

VII.] AUGUST, 1866. [PRICE FOURPENCE, *or 5s. per ann. post free*

STORMS OF JUNE 27TH.

HAVING reported so fully on these storms in our last number, we cannot allow them more space save by way of correction and elucidation. To the report from Whetstone we added (p. 47) a protest, which is confirmed by the following note :—

WHETSTONE.—"I am obliged to you for the copy of your journal ; and beg to say, with sorrow, that I made a most unaccountable mistake in saying that the body of cloud moved E., when the fact was it moved W. The mistake was very foolish on my part, and the only reparation I can make is to acknowledge it promptly."

Thus the details of the Cricklewood storm are *all* reconciled, and *it* may be as considered settled. The Hampton Court storm is involved in some uncertainty; our able correspondent at Gomer House is unshaken in his opinion that it passed over him from E. to W., and most unfortunately no one appears to have noticed the aspect of the broken windows at neighbouring places ; perhaps this will remind readers, that in case of hailstorms, the direction is best shown by broken windows, just as the direction of gales is shewn by prostrate trees.

STORM ON THE COTSWOLDS.

On the night of 27th, the Cotswold Hills and the adjoining valley of the White Horse were visited by a tempest of extraordinary severity and duration. Until five o'clock in the afternoon no indication had presented itself of the coming storm, but shortly afterwards the light and fleecy clouds, erratic in their motion, significant of atmospheric disturbances, were rapidly succeeded by densely black volumes, which almost without notice commenced a conflict of terrible and sublime grandeur. The storm seems to have culminated in the Bourne, near Northleach. At Foss Bridge Inn, the flood was so great that it flowed into the house and attained a depth reaching to the window sills of the general apartments, while in the cellar it acquired a depth of five feet. The church of the village was surrounded by water exceeding three feet in depth, while the roads in places were burst, and the walls thrown down. On the same afternoon at Shaftesbury, a heavy thunderstorm, which lasted upwards of an hour, was experienced. The lightning was very vivid, with loud peals of thunder, and the rain fell in torrents, stopping the gutters, and in some instances rushing into the dwelling-houses of the inhabitants. At Melbury Abbas the storm was accompanied by hail, which did great damage to windows, and killed some fowls.

Chepstow, July 18th, 1866.

MY DEAR SIR,—As I find from the report in the "Meteorological" that the thunderstorms of the 27th ultimo were more general and peculiar than I had supposed, I send some particulars of the passage of one over this neighbourhood, which may be acceptable, inasmuch as you have none from any place nearer this than Newport.

The first indications were visible in the direction of Newport at 5.30 p.m. ; the first thunder heard at 5.50, at which time the telegraph operator at the Railway Station informed me he had received some severe shocks, due to the electrical state of the wires. At this time, as I afterwards heard, the storm was raging severely in the low grounds between Newport and this, especially at Caerwent

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(5 miles distant), where the hailstones were larger than ordinary filberts. From that point the northern boundary of the storm was bent in an E. direction (the line from Newport to Caerwent being N.E. 8½ miles) and just touching the point of land at the junction of the Wye and Severn, (5 miles) it again took a N.E. direction, crossing the Severn at a slight inclination, and reaching the Stroud valley (through which the Great Western runs to Swindon) 19 miles further, at 7.40. This latter information I had from a friend who leaving this at 6 p.m. watched the progress of the storm from the railway on the west bank of the Severn, and met it at the latter point on the east bank. The high lands of the Cotswold range at the head of the valley seem to have terminated the storm in that direction, inasmuch as both the time and direction given by your correspondent at Highworth (Swindon) lead to the inference of a distinct storm. At any rate, the same storm if it began at Cardiff at 4.30 (though your report from Pentyrch infers it came from Neath 35 miles further westward) is thus distinctly traced for at least 53 miles.

During the passage of the storm, 2 miles to the southward of this, the sky was obscured by heavy masses of electrical clouds, but no rain fell, although the view was quite shut off to the southward by the sheets of rain which deluged that part. At 7.10, however, a heavy cloud *returned from the east*, and from this we had a few large drops, about one to each superficial foot, but no more during the night, the minimum temperature of which was 60°. At Gloucester no rain fell, but at 9 p.m. lightning was seen in the direction of the Malvern hills. I hope some of your observers will be able to trace a similarly defined line for the southern boundary of this remarkable storm.

Your's very truly,

JAMES G. WOOD.

P.S.—As regards the startling account of ice at Newport, on which you have a note (p. 52), it is quite possible that the pieces had frozen together *after* they had fallen.

J. G. W.

SIMPLE BAROMETRIC FORMULÆ.

A Simple Rule for Mentally Determining Differences of Height by the Barometer.

To the Editor of the Meteorological Magazine.

Sir,—For rough work like that described by your correspondent, "A Lazy Man," last month, it will be sufficient in all cases where the reading at the higher station does not fall under 28 inches, to multiply the difference of the readings in hundredths of an inch by 9, or if much lower, by 9½. This will not, perhaps, give a very accurate result, but it will be nearer than that indicated, and has the advantage of being easily remembered. For instance, suppose the reading at the bottom of the mountain to be 30, and at the top 28 inches. 200 hundredths multiplied by 9, will give 1800 feet, about 13 feet less than the truth. The rule might easily be made more precise, but it would involve a little calculation and a little effort of memory, which would be too great a task on the energies of "A Lazy Man."

Higher readings require a somewhat lower, and lower readings a somewhat higher multiplier. No correction for temperature is required for the aneroid. With Negretti and Zambra's pocket barometer, a useful table of differences is given, and I have constructed a little scale which I keep in my pocket-book and which answers every useful purpose. Of course this scale finds much more accurate results than the rough rule given above.

If not too much trouble, the reading at the bottom should be noted both before and after the ascent, the mean to be taken as the real observation.

Yours truly,

Barlastone, July, 10th, 1866. W. S.

Dear Sir,—If you think it worth while to publish anything more on the subject of *exact* and *easy* barometric altitude tables, I beg to submit to you a table which I have arranged and computed for my own use, and which I believe possesses considerable advantages over all others known to me.

English mountaineering is performed much more frequently under a temperature of 62°, than at 32°. These tables are computed for temp. 62°, and therefore will

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need no correction at all in 9 cases out of 10 when most other tables are most at fault unless that correction is applied.

When the temp. is much above or below 62°, the alteration of the readings of the Bar. at the rate of 1 inch for 15° or ·2 for 3° is so very simple and easy, as in my opinion to distance all competition. The whole business is, therefore, reduced to three very easy operations: (1.) Correcting bar. readings for temp. of air. (2.) Interpolation between the terms in the table. (3.) Subtraction.

There is no multiplication, no division.

I will work out your own example.

Reading	29·890	26·656
62°—50°=12°	+ ·800	+ ·800
Corrected reading	30·690	27·456
Tabular Numbers	4633	1522
Difference	3111 = height in feet.	

I am, Sir, yours faithfully,

Milland, Liphook, 27th July. J. M. HEATH.

COMPANION TO THE ANEROID, OR MOUNTAIN BAROMETER.

RULE.—When the temp. of the day is $\begin{matrix}\text{less}\\\text{greater}\end{matrix}$ than 62°, $\begin{matrix}\text{increase}\\\text{diminish}\end{matrix}$ *both* the readings of the Bar. at the rate of 1 in. for every 15° of temp. below 62°, or 0·2 in. for every 3°. The difference of the tabular numbers opposite these corrected readings is the true vertical altitude.

Bar.	Vert. Alt.	Bar.	Vert. Alt.	Bar.	Vert. Alt.
	90		96		102
30·9	4824	28·9	2955	27·3	1363
	91		97		103
30·5	4460	28·7	2761	27·0	1054
	92		98		104
30·2	4184	28·4	2467	26·7	742
	93		99		105
29·9	3905	28·1	2170	26·5	532
	94		100		106
29·6	3623	27·8	1870	26·2	214
	95		101		107
29·2	3243	27·5	1567	26·0	0

RADIATION THERMOMETERS.

DEAR SIR,—There is a very interesting letter from "A. B." in this month's *Meteorological Magazine*, on the "Grass Minimum". I cannot understand why the thermometer should be *raised above the ground*; for it seems to me, that it is the upper surface of the earth that is most cooled by radiation, and that the lower stratum of air of 4 or 5 inches thickness is only cooled by contact with the earth and grass.

The extra fall of the blackened minimum is probably due to the radiation of the bulb itself, black surfaces radiating better than any other.

The registration of the minimum upon grass is not of any scientific use, as it is impossible to compare observations made at different places, and for other reasons; but to farmers, gardeners, and others, is doubtless of great importance.

I would caution some of your readers about "Solar Maximum Thermometers in vacuo". In some of these instruments by the first makers a thin cloudiness sometimes appears on the inner surface of the exhausted globe, which is next the sun, caused by an exceedingly small amount of water vapour being left in it. Any one possessing such an instrument should request the maker to change it, as its indications are worse than useless. I am, dear Sir, yours very truly,

G. L. T.

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RAINFALL IN JULY, 1866.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground	Above Sea Level.	Depth of Rain. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which '01 or more fell.
			ft. in.	feet.	inches.	inches.	inches.		
I.	ENGLAND.	Camden Town	0 · 6	100	1·19	— ·76	·24	28	11
II.		Staplehurst (Linton Park)	0 6	200 ?	2·73	+ ·75	·71	6	10
,,		Selborne (The Wakes)	4 0	500 ?	1·38	— ·83	·36	3	8
III.		Hitchen	2 0	240	...	...	...	...	...
,,		Banbury	7 0	345	2·08	+ ·02	·91	28	12
,,		Wisbech	0 6	10	3·02	...	1·11	29	14
IV.		Bury St. Edmunds (Culford)	1 2	...	2·25	+ ·27	·59	[illegible]	11
V.		Calne	0 11	250	1·52	...	·50	2	9
,,		Plymouth (Goodamoor)	0 2	580	2·42	—1·86	·66	6	11
,,		Barnstaple	0 6	31	2·60	— ·26	·74	5	11
,,		Taunton (Fulland's School)	1 4	...	1·79	— ·28	·47	3	12
VI.		Shrewsbury (Highfield)	5 6	200	1·61	— ·46	·66	29	5?
,,		Tenbury (Orleton)	0 9	200	2·17	— ·22	·52	7	13
VII.		Leicester (Wigston)	0 6	220	2·21	+ ·11	1·32	29	10
,,		West Retford	0 6	50	2·70	+ ·64	·74	28	15
,,		Derby	5 0	180	2·41	— ·22	1·57	29	13
VIII.		Manchester	2 7	106	4·31	+1·71	1·99	28	13
IX.		York	0 6	50	2·91	+ ·97	1·22	29	9
,,		Skipton (Arncliffe)	3 0	750	5·24	+2·01	1·20	28	12
X.		North Shields	1 0	124	3·70	+1·89	1·46	30	9
,,		Borrowdale (Seathwaite)	1 0	422	11·18	+3·04	1·77	5 & 9	16
XI.	WALES.	Abercarn	1 3	450	1·62	...	·59	1	8
,,		Haverfordwest	2 0	60	1·55	—1·74	·35	9	12
,,		Rhayader (Cefnfaes)	2 0	880	2·41	— ·44	·60	2	10
,,		Llanberis (R. Victoria Hotel)	1 0	370	1·41	...	·34	8	8
XII.	SCOTLAND.	Dumfries	0 5	70	2·84	+ ·60	1·01	29	12
,,		Hawick (Silverbut Hall)	4 0	512	3·87	...	1·25	4	13
XIV.		Ayr (Auchendrane House)	2 3	94	3·32	+1·16	1·44	28	13
XV.		Otter House	0 6	130	3·38	+ ·07	·66	30	17
XVI.		Leven (Nookton)	0 6	80	2·87	+ ·60	·72	28	14
,,		Stirling (Deanston)	0 0	130	3·27	— ·13	·98	28	17
,,		Logierait	1 0	250	3·16	...	1·45	29	11
XVII.		Ballater	0 10	656	2·58	...	·81	28	14
,,		Aberdeen	4 8	115	3·49	...	·66	29	19
XVIII.		Inverness (Culloden)	3 0	104	3·07	...	·96	30	12
,,		Fort William	0 8	20	3·27	...	·60	8	17
,,		Portree	0 4	60	3·90	—2·17	·84	2	15
,,		Loch Broom	0 8	48	1·91	...	·36	4	14
XIX.		Helmsdale	1 0	34	1·50	...	·25	9	14
,,		Sandwick	2 0	78	1·64	— ·25	·68	2	8
XX.	IRELAND.	Cork	6 0	65	·44	...	·18	5	8
,,		Waterford	4 0	60	·85	—2·46	·28	4	8
,,		Killaloe	5 0	128	1·96	—1·23	·49	2	14
XXI.		Portarlington	9 0	236	1·22	—2·32	·36	6	14
,,		Monkstown	0 6	100	·89	—1·54	·22	3	13
XXII.		Galway	6 0	25	1·94	...	·35	13	15
,,		Bunninadden (Doo Castle)	1 0	...	2·04	...	·47	13	15
XXIII		Bawnboy (Owendoon)	1 3	218 ?	2·66	...	·63	13	17
,,		Waringstown	0 4	191	2·98	...	·70	29	14
,,		Strabane (Leckpatrick)	0 5	260	1·96	...	·54	28	12

+ Shows that the fall was above the average; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain.

ENGLAND.

CAMDEN TOWN.—A fine month, showers in the first and last weeks. Hot from 9th to 21st, but rest of the month cool, some nights chilly. T S on 4th 3 p.m. and 6th 6·30 p.m.

LINTON PARK.—Frequent heavy showers every day for the first week, afterwards hot, dry, and fine to the 28th; the last four days showery; T on 1st, 6th, and 29th; the hottest days were the 12th, 14th, and 15th. Some corn cut at the end of the month, but harvest not general, the second and third weeks being fine, favoured the getting up of the hay, which, though late, has been a better crop than for some years. The prevailing winds have been W.S.W., with often sudden changes without affecting the general character of the weather. Fog on mornings of 21st and 23rd.

SELBORNE.—T on 1st, 2nd, 5th, and 6th; on 15th at 4 p.m., and on 16th at 2 p.m., distant T was heard. High winds on 9th and 10th. Max. 80° on 12th. Prevailing winds S.W. early in the month, latter part N.W.

BANBURY.—Heavy showers with hail and T on 1st, 5th, and 6th. Max. 83° on 12th. Hay-making very nearly completed at the end of the month, crop heavy.

WISBECH.—T S with hail at noon on 1st. T S at 2 p.m. on 5th, heavy rain from 3 to 4 a.m. on 29th, total fall during the 24 hours 1·11. Max. 89°·4 on 13th. Fog on morning of 21st.

CULFORD.—T on 1st. Max. 88° on 13th. Mean temp. of this month is rather less than that of the preceding (June) being 61°·2 to 62°·8. Wheat harvest commenced in this neighbourhood on the 19th, but has not become quite general yet, the last five days of the month having been more or less rainy.

GOODAMOOR.—A beautiful month, but remarkable in this part for the absence of T SS, not a flash of L have I seen. Max. 84°. The rainfall of the first 8 days and the great heat after did wonders in forcing on vegetation.

HIGHFIELD, SHREWSBURY.—Max. 87° on 12th.

ORLETON.—Heavy R followed by T and L at 11.16 a.m. and 4 p.m. on the 6th. The first week cold and showery; very fine from the 8th to the 26th, without any R, and occasionally very hot; cold and stormy thence to the end of the month. Temperature very variable, but a little above the average. Max. 84°·2 on 12th; hazy for many days.

WIGSTON.—The range of the max. ther. during the month has been greater than I have ever known; on the 12th the reading was 92°·5 and on 31st only 57°·0, the heat of the 12th was 3° more than I have ever recorded; this district has suffered more from drought than almost any other, consequently the ripening of the corn has been more rapid. Wheat being ripe and reaping commenced on the 30th.

W. RETFORD.—It is with deep regret we announce the death of the able observer at this station—(The Rev. C. D. Butterfield).

DERBY.—July commenced and ended wet, the intermediate period being dry and unusually hot, allowing the great bulk of hay in this neighbourhood to be led in excellent condition. An earnest and steady R commenced on Saturday night (29th) and continued till 7.50 on Sunday morning (30th), 1·57 in. having fallen in the 24 hours; the Derwent has filled its banks, and another half inch of R would flood the low lands, but as the bar. is rising and the wind N. probably the weather will improve.

ARNCLIFFE.—From 10th to 26th beautiful weather, cold towards the end of the month. Max. 90° in shade.

NORTH SHIELDS.—T S on 13th; fine dry month till the 28th, on the evening of which day R began to fall heavily, it continued through the 29th; the morning of 30th was fine, but at 5 o'clock it again began to R; during the night 1·46 in. was measured; wind N.E. and a heavy storm.

SEATHWAITE.—Splendid weather from the 15th to 27th; Max. (at Tarnbank) 79°·4. Five days on which the R exceeded 1 in.

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WALES.

ABERCARN.—A dry warm month, with 14 cloudless days.

HAVERFORDWEST.—July commenced with high winds, R, and a low temp. seldom reaching 60°; thence to the 27th, the temp. was above the average for this locality, exceeding 70° on many days; the latter part of the month was very close and sultry, with a damp foggy atmosphere, rendering it very unhealthy and oppressive, the last three days were fine and fresh; wind very boisterous from the N. with a considerable fall in the temp. No T during the month. The prospects of the harvest are generally favourable.

CEFNFAES.—Slight T S on 27th; thick haze on the hills from 23rd to 26th; month generally dry and hot. Max. 88° on 15th.

SCOTLAND.

DUMFRIES.—First nine days showery; from 10th to 26th, weather hot and scorching, pastures dried up and withered by the drought, streams very low, fine weather for haymaking. Max. on 12th 88°; at the close of the month, four days wet, rainfall on 29th very heavy (1·01 in.) R of immense benefit to pastures and turnip crop; harvest commenced with cutting barley on 30th, and will be general after the 6th of August. Wheat is a good crop, oats are light and below the average, potatoes are very good.

SILVERBUT HALL.—Heavy fall of R on the 4th, half-an-inch falling between 10 and 12 a.m., severe T S on the 13th, L of the forked and ball kind, very vivid and T very loud, the month taken as a whole may be said to have been a favourable one for gardeners and husbandmen.

AUCHENDRANE.—On 2nd at 11 a.m. a very heavy shower of H, which for a time made the ground appear white; on 1st and 5th slight T S at a distance, (the only T of the month), the severe T S S which prevailed on the 16th over the E. and S. E. of Scotland (between the Grampians and Roxburghshire) did not reach here, the day, though sultry with dense and heavy clouds, being fine. On the 28th 1·44 in. of R fell, which slightly, and only for a short time, increased the water in the rivers which had been, and continued very small during the month.

OTTER HOUSE.—Little or no R from the 11th to the 29th, the R above the average; colder than June, but favourable to the crops.

NOOKTON.—The weather warm and fine, changing with R to a lower temp. on 26th.

DEANSTON.—Only ·46 in. of R fell from the 11th to the 26th; distant T in the N. on the 4th, and in the E. on 13th. Max. 81° on 4th.

LOGIERAIT.—Very hot from 4th to 27th; a very severe T S on 15th, several slight accidents from the L; first T at 3 p.m., between 5 and 6 the L was very vivid and the roll of the T almost incessant, storm ceased at 6.30. Hay not a heavy crop, but secured in fine condition. Pastures suffering from drought, and harvest prospects not very good. Max. 83° on 12th.

BALLATER.—Some very warm weather in the early part of the month, ther. in shade on 12th being 86°·6; on the 13th a severe T S in the afternoon from S.W. to N.E.; from 5 to 6.30 p.m., the L was very vivid and continuous, and T tremendous, H and R accompanied the storm but no damage was done; from the 15th to 26th, dry, easterly winds caused the crops to suffer, but from the 26th to the end more than 1·50 in. of R fell. Haze on the 13th, and on the hills on 25th.

ABERDEEN.—T on 1st, 2nd, 3rd, 4th, 5th, and 13th; fog on 13th, 29th and 30th. Max. 78°·2 on 11th. Rain and wind rather above the average of last 10 years; temp. rather below it.

FORT WILLIAM.—On the whole the month has been a very pleasant one; less R has fallen than is usual at this season of the year, and water for domestic purposes has been scarce; the formation of the country is such that much moisture is required. In July last year nearly 2 in. more R fell than this year.

PORTREE, ISLE OF SKYE.—Very fine weather, crops of all kinds looking well; potatoes of excellent quality and very abundant, no appearance of blight at present; there has not been such a long dry time in this island in the memory of the oldest individual as there has been this summer. Water supply very scarce, many of the springs being dried up. No storms of any kind during the month.

LOCH BROOM.—A remarkably dry month; were it not for the copious dews at

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night the consequences would have been serious; the cereals though short will be more than compensated by the luxuriance of the turnip and potatoe crops; our running streams do not show any increase, and the ordinary brooks are still dry, an occasional shower does not appear to have any effect upon them. On the 13th we were visited from 3 to 8 p.m. by the most terrific T S we ever remember, the L was vivid and almost incessant, while the T was awfully near, the amount of R accompanying this storm was wonderfully small.

HELMSDALE.—The heaviest T S that has visited this country for many years passed over this district on 16th, from S.E. to N.W., the L was very vivid and beautiful, the storm continued almost without intermission from 3 p.m. on 16th to 1 a.m. on 17th, but the amount of R that fell was very small.

SANDWICK.—Four peals of T with heavy H on 2nd; severe T S from about 3 to 6 a.m. on 14th, which passed a little to the eastward of this place. Stratus filling the valley on morning of 31st, and Aurora at night.

IRELAND.

KILLALOE.—Max. 83°·5 on 12th.

MONKSTOWN.—A very dry month, scarce *any* R from the 5th to the 27th. Millers complaining of want of water in the streams and rivers. The crops all look remarkably well, the hay well saved, in most places it is a very plentiful crop. Some days were warm but only nine above 70°. Max. 78° on 10th. On the 31st the mountains in Co. Down, about 60 miles distant, were perfectly clear down to their very bases, this extreme clearness was succeeded by very heavy R on 1st August.

DOO CASTLE.—Wet till the 8th, from which to 25th no R fell, save ·47 in. on the 13th. Remainder of month more or less wet, 16 days of this month were delightful. Fog on morning of 11th. No T or L.

OWENDOON.—This has been a most favourable month, and all crops are looking very well. Hazy on 27th.

WARINGSTOWN.—Fine seasonable weather throughout. All crops looking unusually well, but somewhat late.

LECKPATRICK.—Fine, no R for a fortnight in the middle of the month. Max. 81°·4 on 12th. R at the end of the month came in very usefully for the crops.

DISCOLORATION OF PAINT BY RAIN.

Trinity College, Dublin, July 2nd, 1866.

MY DEAR SIR,—Aware as I am of the deep interest you take in everything connected with Meteorology. I think the following may not be unacceptable to you.

For some time past I have noticed on walking through the city during the prevalence of rain, that certain hall doors appeared *stained* wherever a drop of rain had fallen on them.

This effect lasted for some considerable time after the rain drops had evaporated. So far as I have been able to ascertain, but one description of paint undergoes this strange transformation, viz., a *dark green.* Also, this curious effect is but seldom observable, perhaps on not more than eight or ten days in an entire year. From inquiry and from observation I have arrived at the following facts.

First, as regards the composition of the paint, which seems most influenced, it is

Dark Brunswick Green (*i.e.* "Muriate of Copper.")
Lampblack.
English Umber (*i.e.* an ore of iron and manganese)
"*Patent driers*" (a mixture of whiting, Ca O, Co_2, and Zu O, So_3.)

Secondly, as regards the occasions on which this phenomenon is usually observed.

Heavy rain, and high wind, resulting from a *union* of S.W. and N.E. currents, the barometer being generally very low, the wind strong from S.E. or S., and a large *per centage of ozone* being frequently noticed. Probably we may have in this phenomenon a ready test for ozone, or it may be that *ammonia* gives origin to the stains left by the rain drops.

If you think it worth while, you might kindly lay these facts before the readers of the "*Meteorological Magazine.*"

Yours very truly,
JOHN WILLIAM MOORE, B.A., SCH. T.C.D.

P.S.—The stain is of a *slate-blue* colour. The last day I noticed the effect was the 18th of June, when the state of the weather was as follows:—

Very wet, 1·163 in. of rain in 24 hours, wind E.S.E., upper current from S.W.

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to S. Barometer 29·46, and thermometer but 48°, the wind also was very high, *ozone* 100 per cent. at the Ordnance Survey, Phœnix Park.

As it seemed desirable to solve the problem as soon as practicable the above letter was submitted for report, and the following note received:—

DEAR MR. SYMONS,—I have read over Mr. Moore's communication to you which you placed in my hands. I fear, however, that without personal inspection of the phenomenon he describes, I can offer little else than plausible guesses.

It is very common with painters to cover a surface with ultramarine before putting on Brunswick green, and to lay on the latter pigment only in a comparatively thin coating. After the oil used for mixing has become oxidised and dry (and this happens very soon when "turpentine substitute" has been added in large quantity) the two layers are in close contact; and water by rendering the outer thin layer more transparent, might cause the ultramarine to show underneath.

The only source of ammonia in the rain which I can imagine at the present moment, is the vapour from gas-liquor. If the liquor were being collected into casks at the gas-works for sale, and the wind was blowing from S.E. at the time, this might *possibly* account for the slate-blue appearance. Such a supposition is, however, very unlikely.

Ozone can have nothing to do with the matter. There is no good evidence that ozone ever occurs in air.

I would advise your correspondent to apply to one of the resident teachers of chemistry in Dublin; the question would probably be settled immediately.

I am, yours very truly,

University College, London. EDMUND J. MILLS, D.Sc. F.C.S.

A NEW ENEMY TO RAIN GAUGES.

MY DEAR SIR,—I have just encountered a new enemy to rain gauges, which had I not discovered it in time, or had I not kept several gauges of different sizes, heights, &c., might have caused me considerable annoyance. On looking into the receiver of my Apps' gauge (5 in.), I detected a small leaf, and, supposing it to have been blown in by the wind, proceeded to remove it, when I saw several more equally small, and some fragments. On carefully examining these leaves and fragments, I discovered that the pipe of the receiver of the gauge was completely filled up with nine nests of one of the genus Megachile, or leaf-cutter bee. I had great difficulty in removing them, so beautifully were they fitted and soldered as it were to the tube. To prevent the recurrence of this, I have fastened a little cap over the aperture of the pipe, leaving just sufficient space to allow the rain to trickle through freely, but small enough to exclude a similar invader on any future occasion. Thinking you might like to notice this in the next number of your *Meteorological Magazine*, I send you this account. Yours always, very truly,

Strathfield Turgiss Rectory, July 20th. C. H. GRIFFITH.

THE TRUE HISTORY OF A THUNDERBOLT.

ON July 2nd one of the London daily papers startled some of its readers by inserting a letter on the thunderstorm of June 30th, in which the writer said, "At six o'clock it broke out again with increased violence, the rain descending in torrents, and at a few minutes past seven a thunderbolt fell in the gutter opposite my house (in Westbourne Park, Notting Hill,) and was smashed to pieces, one of which I have at the hour at which I write. Numbers of persons are still searching for the fragments."

Feeling certain that there was a weak point somewhere, inasmuch as "thunderbolts" have no existence, we called on the writer of the letter and other residents, found the story amply confirmed, received several pieces of the "thunderbolt" (by the bye, some were sold at 10/- and 15/- each), and eventually ascertained that one of the pupils of an analytical chemist had availed himself of his tutor's absence to fill a capsule with materials calculated to burn vigorously, and explode in heavy rain, and, during the height of the storm, had thrown the burning mass into the gutter, so making an artificial thunderbolt. It is no wonder that the neighbours were taken in by a trick so well-arranged.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

VIII.] SEPTEMBER, 1866. [PRICE FOURPENCE, or 5s. per ann. post free

THE METEOROLOGICAL DEPARTMENT OF THE BOARD OF TRADE.

THE appointment of chief of the above office could scarcely be a sinecure in a country like this, where ceaseless alternations require attention, and where so many fancy they possess the key of nature's secrets, and can tell whence the wind cometh and whither it goeth. Admiral FitzRoy, however, took such unusual steps to bring his work before the public that it is no wonder that during the ten years in which he presided over the Department constant criticism was his lot; and that with his total lack of management, all his energy, experience, self-devotion, and zeal, were inadequate to cope with the pressure of work necessarily incidental to the position he held. However, the good old Admiral is gone, and we can only repeat the sentiment of one of the leading journals—"He is gone to his rest, and many a storm-sheltered mariner will look to the signal drum, and grieve with a manly sorrow for the loss of Robert FitzRoy."

Shortly after his death, a letter was addressed by the Board of Trade to the President of the Royal Society asking the advice of the Royal Society—(1) As to the extent to which the Department had fulfilled the objects for which it was organized; (2) As to the reliability of forecasts and storm signals; (3) As to the future conduct of the Department. About a month afterwards (June 15th, 1865), General Sabine, on behalf of the Royal Society, replied—that they considered the evidence submitted to them justified their recommending that the forecasting should remain in the hands of Mr. Babington, by whom it had been virtually carried on for some months past; that the meteorological observations made at sea by the captains of the royal and merchant navies be transferred to the custody of the Hydrographer, with a view to the introduction of the results into the Admiralty Charts; and lastly, that an entirely new system be organized for observing the "Land Meteorology of the British Islands," the stations being not less than six* in number, and provided with self-recording apparatus, the records from which should be sent weekly or otherwise to Kew Observatory, which is hereby proposed as the centre of this system. The Board of Trade subsequently expressed a desire for more thorough consideration of the progress made in marine meteorology, suggested the appointment of a small committee of investigation, and intimated that they saw some difficulty in the proposed maintenance of two establishments, one at Whitehall and one at Kew. Eventually, the

* Falmouth, Kew, Stonyhurst, Armagh, Glasgow, and Aberdeen, are proposed.

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following three gentlemen were appointed (in November, 1865) a committee of investigation:—

Royal Society—FRANCIS GALTON, Esq., F.R.S., General Secretary of the British Association.

Admiralty—STAFF-COMMANDER EVANS, R.N., F.R.S., Chief Naval Assistant to the Hydrographer.

Board of Trade—T. H. FARRER, Esq., one of the Secretaries to the Board of Trade.

Their report was presented to Parliament last session, and proves three points at once—first, the desirability of such a thorough investigation, the efficacy of the committee proposed by the Board of Trade, and the ability (if that wanted proving) of the persons nominated. It is rather voluminous (81 pages folio), and so replete with facts and details of importance as to render it extremely difficult to present an abridgment doing it full justice. After giving a clear and succinct account of the origin and original functions of the Department, it notices the steps taken to obtain meteorological observations at sea, and their results; also the method adopted by the Department in extracting observations, which comes in for detailed criticism of an exhaustive character, and a plan for future use is suggested of considerable value, and which we will therefore explain rather fully. Of course the essential difference between the meteorological register of a ship, and an observatory, is that the place of observation is movable in one case and fixed in the other. This difficulty is obviated by portioning out the ocean into squares embracing 10° of latitude and 10° of longitude—of course, therefore, of variable real area, but still readily recognized divisions. The old plan was to have "Data Books" for each subject, paged to correspond with the squares just referred to; then if the Department were working up any subject, the ships' registers were searched for that one detail only, and the rest was left uncopied; thus at least eight or ten separate searches were made, involving quite fourfold the trouble of the plan now proposed, which is, that each register should be copied out at once on to a set of printed cards, which could then be searched, sub-divided to any extent, and available in any way. We have seldom seen a more sensible or useful suggestion. The Committee proceed to enumerate and comment on the publications of the Department, which as a rule are condemned for their want of method. Among their suggestions for future practice is that of a form (Appendix p. xviii.) in which certain observations might be tabulated for publication, which is either an absurdly complicated misprint, or it requires explanation. The year is divided into four quarters, as follows:—(1) December, January, February; (2) March, April, June; (3) July, August, September; (4) August, November, December. May and October are therefore omitted, and August and December mentioned twice. We cannot comprehend this at all.

We have already remarked that the Board of Trade suggested a possible difficulty by the maintenance of a duplicate establishment at Kew; a paragraph, however, on p. 17 of the report under notice shows a third branch of the Meteorological Department:—

"The Admiralty Hydrographic Department are now devoting considerable pains to the preparation of physical charts—such as Ice, General Ocean Currents, and

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Wind Charts. In these it is proposed to embody the results collected by the Meteorological Department in a form available to seamen."

The second part of the report is occupied by an account of the origin, and a rigorous examination of the Forecasts and Storm Warnings issued by the Department; it is far too voluminous for extract, but the following are the conclusions arrived at by the Committee:—

"(1) That the maxims on which the Department acts in foretelling weather have not been reduced into any clear or systematic form, and are not shown to have been established by sufficient induction from observed facts.

"(2) That as a matter of fact the Daily Forecasts are not shown to be correct, and that they are not in our opinion useful.

"(3) That the Storm Warnings, so far as they indicate the force of coming gales, have been sufficiently correct to be of some use, and that their utility is widely admitted. Also, that they have improved, and that they are probably capable of still greater improvement.

"(4) That the Storm Warnings, so far as they indicate the direction as well as force of coming gales, are not shown to have been so far precise or correct as to be of use."

After mentioning the benefit conferred by the erection by the Department of 95 good barometers at some of the poorest of the fishing villages, the report notices and approves the suggestion of the Royal Society as to the establishment of the six stations with self-recording instruments already referred to, proposes that they be supplemented by about sixty secondary stations, lighthouses, &c., and that the returns thus obtained should be laid down on maps similar to those of M. Le Verrier, and published at a low price. They insist on the officer issuing a storm signal "noting down at the time, and reducing into exact shape afterwards, the maxims or principles which have guided him in making the Signal of Force, or Prediction of Direction; the facts to which those maxims are applied; the mode in which he has applied or combined them, the value he has attached to each of them, and the value of the probability he has thus obtained, and which is indicated by the signal or prediction"; they also propose that a rigorous check on the signals be kept by collating all available records with the predictions.

They further propose that the collection of ocean statistics should continue much as it was originally arranged by Admiral FitzRoy, but that the discussion of the results should be on the improved plan already explained; that additional buildings be erected at Kew, and the branch department there should be under the control of a scientific body receiving a grant of about £7000 per annum from Government, and out of it defraying all expenses incidental to the thorough and systematic collection of weather statistics of the British Isles, and the maintenance of the system of storm warnings. As far as we can see, the estimated expense of the Kew and Board of Trade Meteorological Departments would be about £15,000 per annum, to which must be added the expenses incurred at the Hydrographic Department in getting out and publishing charts. The report goes on to express the hope that at no distant day one international centre may be established, and thus all divided and therefore duplicate labour be avoided; and concludes with the following paragraph:—

"We feel, moreover, that we should be doing great injustice to ourselves if we were to allow it to be supposed that we undervalue either what the late Admiral

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FitzRoy attempted or what he effected. To his zeal and perseverance is due the credit of establishing a system of Storm Warnings, which is already highly prized by the seafaring class. And if a more scientific method should hereafter succeed in placing the practice of foretelling weather on a clear and certain basis, it will not be forgotten that it was Admiral FitzRoy who gave the first impulse to this branch of inquiry, who induced men of science and the public to take interest in it, and who sacrificed his life to the cause."

FLOODS IN THE NORTH RIDING OF YORKSHIRE.

DESTRUCTION OF A RAILWAY BRIDGE.

MALTON, *Thursday, Aug. 30th.*

THE continuous rains of Wednesday have (for the second time this summer) caused great districts of the North Riding valleys to be inundated, causing a destruction of farm property, from which the county has not suffered since 1857, when a similar flood occurred. The late rainy season has so saturated the land that the whole of the last extraordinary rainfall ran rapidly off into the streams, and in that short period the North Riding rivers have risen from summer level to a state of flood. So heavy was the rain of Wednesday that the return railway journey from the Whitby Agricultural Show to Malton was made through an infinite array of cascades, every glen of the romantic Newton Dale being overcharged with water from countless contributory streamlets. On the eastern side of the moors the waters drain to the sea by the Esk—a meandering stream which the Malton and Whitby Railway crosses some dozen times in half-a-dozen miles. This stream receives the drainage of the Ellerbeck and the Gothland valleys, and rose to a state of flood in a few hours. The wooden bridge No. 9, from Whitby, being old, was about to be restored or replaced, and the railway company had commenced operations for a permanent structure. This bridge was watched with some anxiety all last night, the traffic of Wednesday (much of it excursion traffic) having all passed the bridge in safety. During the night, however, the flood literally floated the bridge and had drawn the piles, so that the trains could no longer pass. In Ryedale the rivers have risen rapidly, and above Newsome Bridge have either burst or overflowed the banks. This morning large tracts of country under crop are flooded, and in some places so deeply that the heads of the growing crops are only just above water. Of course all the pastures will again be spoilt for a time by the mud left by the flood water. The old Derwent, with the rapid flow of the moor streams, has again overflowed, and a railway journey to Pickering shows the extensive grazing lands one sheet of water for miles. At noon the waters were still rising, and it was feared the country of the Derwent proper, from Malton downwards, would also become extensively flooded.

MALTON, *Friday.*

It is thirty-five years since any approach to the scene of desolation witnessed to-day in the fertile vales of North Yorkshire has occurred. The constant rains of the last fortnight, culminating in the enormus rainfall of Wednesday, have carried destruction along the course of every river. Every valley has suffered from flood, more or less, but the greatest destruction has been in Ryedale, and among the Rye tributaries. In the upper part of the wide vale, a great lake has been formed by the rivers Rye and Riccal, which met, completely overflowing the whole intermediate country, inundating houses, and rendering roads impassable. Nunnington suffered much from this disaster, whole crops of stooked corn being floated away. The Kirkdale beck (always impetuous) rose with unexampled rapidity, and the ford was no longer safe. A pony and cart, with two persons in it, were carried some distance, and rescued with difficulty. Some other narrow escapes occurred here. The Farndale beck rose equally quickly, and at Yawdsworth Mill much timber was carried away, and a newly built house washed down. At Sinnington the Leven flooded the village, and floated large timber about in great confusion. Mr. Carter, of Kirbymoorside, with another gentleman, on horseback, were obliged to return to Pickering, and took refuge in the inn near the bridge. The house being full, they were compelled to sit by the fire till daylight, but the water entered during the night, and flooded the house, confining the inmates to the upper story, necessaries having to be given them from the street. The low part of the town of Pickering was much flooded. Between Kirbymoorside and Malton, miles of road

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were flooded, and the inhabitants were prisoners in their houses in various places. At Marton the water was believed to be five feet deep in the village. From Normanby corn has been floated out of the fields as far as Barugh Hill, three miles. The damage in Ryedale cannot be estimated—whole farms are flooded. Not only corn-fields, but pastures, in splendid trim, are under water, and this morning stock were standing belly deep in the flooded lands. Near Malton the flood is increasing. By some accident the self-acting clough, in the Rye had been propped open, and in consequence the flood obtained access to Old Malton Moor, which, for the first time since the enclosure, half a century ago, is flooded. Farmers are busy fishing for their corn ricks in the flood waters. At Norton some pastures are overflowed, and much property has been destroyed in the brick-fields. Hundreds of acres are flooded by the bursting of the banks above Newsham.

The bridge near Grosmont, which failed yesterday morning, has become a total wreck, and a stationary engine erected to pump the water from the coffer-dam of the intended new bridge has been washed away, and is not yet found.

On Thursday morning, August 15th, the greatest flood ever known there occurred at Stokesley. The rain descended in torrents on 29th, and numberless cataracts were formed on Roseberry Topping and the adjacent hills. These meeting in the valley caused the small streams to be swollen into a foaming, rushing river. The stream called the Leven in particular overflowed its banks, and the water swept away all the sheaves and stacks of wheat along its course. On Wednesday evening the road between Stokesley and the Railway Station was so much flooded that the water entered the omnibus which was plying between the two places. The town itself, which adjoins the Leven, was under water, which entered a number of the houses in the lower part of the town, and was knee deep in the streets. The fields in which the show of the agricultural society was to have been held were flooded, so that not even an entrance into them could be effected, and under these circumstances the exhibition of stock had to be abandoned.

The inundations in North Yorkshire were rapidly lessened on Saturday, and on that day the North-Eastern Company had succeeded in throwing a temporary bridge across the Esk at Grosmont in place of that washed away on Wednesday night. During the floods it appears that, in addition to the damage to crops, many cattle and sheep were drowned, and some carcases were floating down the Derwent on Friday. Much land is still under water, and since the last report the banks above Ganton have burst and several farms are flooded, one farmer at Binnington having 100 acres of corn under water. The towns of Stokesley, Pickering, and Thirsk have suffered most.

As so often happens (in spite of the increased number of observers) there are few stations in the district which suffered most severely, and some of the stations being temporarily in charge of deputies, the returns are not so complete as they ought to be; in reply to inquiries we have been favoured with the following details:—

WHITBY.—Total rain in August 3·38, rain on 29th 2·22. The fresh down the river greater than for many years, but much exaggerated in some papers.—*M. Simpson.*

SCARBOROUGH.—Total in August 5·86, rain on 29th 1·82. Doubtless the superabundance of rain in July and the early part of August has kept the springs high, and so assisted in causing the great damage which was the *immediate* result of the rainfall of the 29th.—*Cornelius B. Fox, M.D., M.R.C.P.*

FILEY.—Total in August 3·85, on 29th 1·92.—*D. Philliskirk.*

BEADLAM GRANGE.—Total in August 4·13; on 29th 1·50.* From July 25th to September 3rd (6 weeks) we have had 8·2 inches.—*J. H. Phillipps.*

MALTON—Total in August 3·46, on 29th 1·30 inches.* Rain much heavier up by Beadlam Grange; flood came from that direction.—*H. Hurtley.*

NORTHALLERTON.—Total in August 8·60. Daily register not kept regularly, and fall for 29th unknown, but very great.—*W. T. Jefferson.*

MIDDLESBOROUGH.—Total in August 3·24, rain on 29th 1·85. A gale came up from N.E. on 28th, with rain, which continued all day on 29th. Large tracts of low land with the standing crops were flooded, several of the small streams were swollen and overflowed their banks, doing a large amount of damage.—*W. Fallows.*

* Approximate only; gauge not kept regularly owing to absence from home.

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RAINFALL IN AUGUST, 1866.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground	Above Sea Level.	Depth of Rain. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	inches.	inches.		
I.	ENGLAND.	Camden Town	0 6	100	2·76	+ ·12	·87	29	17
II.		Staplehurst (Linton Park)	0 6	296	2·15	— ·56	·40	27	16
,,		Selborne (The Wakes)	4 0	500 ?	2.66	— ·51	·90	6	16
III.		Hitchen	2 0	240	3·16	+ ·81	·92	30	20
,,		Banbury	7 0	345	3·52	+1·39	·96	29	19
,,		Wisbech	0 6	10	3·42	...	·54	12	18
IV.		Bury St. Edmunds (Culford)	1 2	...	3·39	+ ·95	1·28	29	15
V.		Calne	0 11	250	2·52	...	·65	29	13
,,		Plymouth (Goodamoor)	0 2	580	6·52	+1·53	1·30	12	18
,,		Barnstaple	0 6	31	3·99	— ·20	·85	12	20
,,		Taunton (Fulland's School)	1 4	...	1·65	—1·03	·44	29	20
VI.		Shrewsbury (Highfield)	5 6	200	4·36	+1·47	2·02	29	16
,,		Tenbury (Orleton)	0 9	200	2·99	+ ·11	·78	30	20
VII.		Leicester (Wigston)	0 6	220	4·41	+2·22	1·30	29	21
,,		West Retford	0 6	50	2·73	+ ·40	·70	28	15
,,		Derby	5 0	180	6·56	+3·96	2·66	28	22
VIII.		Manchester	2 7	106	5·12	+1·62	1·08	29	26
IX.		York	0 6	50	3·06	+ ·35	·98	30	16
,,		Skipton (Arncliffe)	3 0	750	5·33	— ·61	1·08	29	19
X.		North Shields	1 0	124	3·24	+ ·39	1·39	29	19
,,		Borrowdale (Seathwaite)	1 0	422	12·69	—1·39	2·20	7	25
XI.	WALES.	Abercarn	1 3	450	4·51	...	1·95	6	15
,,		Haverfordwest	2 0	60	5·00	+ ·12	1·84	29	12
,,		Rhayader (Cefnfaes)	2 0	880	4·21	— ·45	·76	28	23
,,		Llanberis (R. Victoria Hotel)	1 0	370	6·42	...	·85	28	20
XII.	SCOTLAND.	Dumfries	0 5	70	3·27	— ·61	·36	6	23
,,		Hawick (Silverbut Hall)	4 0	512	3·31	...	·58	31	19
XIV.		Ayr (Auchendrane House)	2 3	94	4·86	+ ·89	·56	1	23
XV.		Otter House	0 6	130	6·89	+ ·87	1·12	6	22
XVI.		Leven (Nookton)	0 6	80	3·42	+ ·44	·51	6	19
,,		Stirling (Deanston)	0 0	130	6·14	+1·52	·92	6	22
,,		Logierait	1 0	250	3·66	...	·55	1	15
XVII.		Ballater	0 10	656	2·84	...	·47	1	19
,,		Aberdeen	4 8	115	3·29	...	1·06	8	20
XVIII		Inverness (Culloden)	3 0	104	2·42	...	·37	2 & 4	16
,,		Fort William	0 8	20	5·27	...	1·05	3	22
,,		Portree	0 4	60	7·84	+ ·39	1·46	26	25
,,		Loch Broom	0 8	48	4·87	...	1·25	3	21
XIX.		Helmsdale	1 0	34	2·74	...	·49	13	19
,,		Sandwick	2 0	78	3·24	— ·47	1·02	4	20
XX.	IRELAND.	Cork	6 0	65	4·60	...	1·23	22	18
,,		Waterford	4 0	60	3·49	— ·46	1·02	24	15
,,		Killaloe	5 0	128	4·55	— ·38	·63	6	24
XXI.		Portarlington	9 0	236	2·63	—1.86	·36	2	27
,,		Monkstown	0 6	100	2·22	— ·99	·43	1	24
XXII.		Galway	6 0	25	5·11	...	·72	26	23
,,		Bunninadden (Doo Castle)	1 0	...	5·39	...	·77	6	28
XXIII		Bawnboy (Owendoon)	1 3	218 ?	5·22	...	·72	6	26
,,		Waringstown	0 4	191	2·90	...	·65	1	26
,,		Strabane (Leckpatrick)	0 5	260	4·46	...	·56	8 & 18	26

+ Shows that the fall was above the average ; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail.

ENGLAND.

CAMDEN TOWN.—Heavy continuous rain on 29th, and unusually dark, especially as there was no fog.

LINTON PARK.—The middle of the month pretty fine, but at no time has there been more than four consecutive dry days. T on 10th and 27th. Gale on 7th, frequent showers rather than any great rainfall. Winds chiefly S.W. and W. Harvest operations nearly completed, without much harm being done by the rain. The T S on the night of 26th-27th, very severe at Staplehurst; the T here was very alarming, but the rain appears to have been very partial, only ·40 in. falling here, and some of that not attributable to the T S which was at its height at 1 a.m.

SELBORNE.—High Wind with R all the evening of the 6th, and continued high winds till the 9th. Very dense fog from 20th to 25th. Max. ther. 73° on the 24th. Min. 37° on 19th. Prevailing winds S.W. to N.W.

BANBURY.—H and T in the neighbourhood on the 10th. T S on 28th; continued rain thence to 29th. Max. 73°. Harvest commenced in the first week; at the end of the month a large proportion of the wheat was carried, but much barley was still uncut.

WISBECH.—Gale on 4th, 12lbs; on 7th, 15lbs. L at 10 p.m. on 8th. T S on night of 10th, and at 3 p.m. on 16th. Fog on 22nd. Lunar halo on 23rd.

CULFORD.—High winds on 5th, 6th, and 7th. T S on 10th, 24th, and 29th. Weather during this month has not been very favourable for harvest operations; they are, nevertheless, nearly finished, and most of the grain got in tolerably good condition. Max. 78° on 26th.

GOODAMOOR.—T S at a distance on 16th, 20th, 26th, 27th, and 28th.

TAUNTON.—R fell in very heavy showers on 28th, registered at 9 a.m. on 29th ·44. Max. 85°·5 on 24th. Failure in wall fruit; apples very small and hanging in clusters on the trees.

DERBY.—2·66 in. was measured on the morning of the 28th; on the 2nd of August, 1846, 2·29 in. fell, which is the nearest approach to it in 25 years, the extent of my experience.

MANCHESTER.—T SS on 7th & 8th. The month may be considered remarkable, from rain having fallen nearly every day.

ARNCLIFFE.—First half of the month dark and sunless. Max. 66° on 20th.

NORTH SHIELDS.—Cloudy, damp mouth. Barley cut on 17th. Very fine to 19th, cloudy but fair to 25th. L on 26th. Large lunar halo on 27th. Heavy rain on 29th, 1·39 in. Wheat cut on 27th.

SEATHWAITE.—A cold, wet, and ungenial month, detrimental to harvest operations, though the crops are abundant. R on 25 days, on four of which it exceeded an inch.

WALES.

ABERCARN.—A dull heavy month, generally sultry, with occasional heavy rain, 2 in. having fallen in 24 hours on the 5th and 6th. Prevelent winds W. & S.W. Outbreak of Asiatic Cholera at Abercarn, on 27th.

HAVERFORDWEST.—The month commenced cold, cloudy, windy, and wet, so continued till the 14th, the succeeding 10 days being fine and dry, but below the average temp. of August, though some days were warm, the nights unusually so, on two or three nights exceeding 60°. On Monday the 27th, 6 p.m., a tremendous shower of rain producing ·40 in. in half an hour; the following day was cloudy and close, R began at 8 a.m. and continued with increasing steadiness and a heavy gale till past midnight; high winds and showery to the end of the month.

CEFNFARS.—Heavy storm of R on afternoon of 28th. An ungenial harvest month. H S 8 p.m. on 10th.

SCOTLAND.

DUMFRIES.—The weather during August has been broken and showery, there being only eight days without R. T on 11th and 31st. H on the 10th. Very unfavourable harvest weather, but the crops here sustained less injury than was expected. The R has been of great benefit to the pastures and turnip crop. Wheat and turnips fully an average; potatoes considerably above it; barley about the

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average, and oats nearly so. The day temp. has been rather below, and the night above the average.

SILVERBUT HALL, HAWICK.—First two days rather cold; from 3rd to 9th very windy. T on 9th and 10th, followed by cloudy weather up to the 16th. Fine growing weather during the remainder of the month, turnips and other green crops generally looking well. Harvest operations commenced on most of the farms.

AUCHENDRANE.—Greatest rainfall on the first, ushered in our periodical rains called the "Lammas Flood," it has been more prolonged and abundant than usual, and has caused this August to be both a cold and wet month. High winds on 7th and 27th. Gale from S.W. on 26th. The greatest evaporation from a water surface ·240 in. was on the 1st, with S.W. wind and sky clear, no R till 3 p.m.; and the least was on the 9th and 14th with a N. wind and cloudy sky. *Blue* mist on 16th and 20th from 7 to 8 p.m., and on 21st. River highest on 19th, also a little raised on 5th, 7th, and 17th. A severe T S on 20th (the only one of the season); one of the road labourers near Ayr killed thereby. Potatoe disease first noticed on 24th.

OTTER HOUSE.—A wet month; R nearly an inch above the average; harvest commenced on the 27th; a fair crop of all kinds, turnips luxuriant; potatoe blight prevails to a certain extent.

DEANSTON.—No T except on 9th, and that distant; max. 69° on 26th; wet month; vegetation backward, very little done to the harvest at the end of the month.

LOGIERAIT.—A fine month for vegetation; the R at the beginning of the month was much needed; harvest operations now general.

ABERDEEN.—T on 7 days; fog on 8 days; bar. and temp. below the average; force of wind and rainfall, above it.

CULLODEN.—Showery; T on 9th.

FORT WILLIAM.—Fresh snow on Ben Nevis on 15th.

PORTREE.—August has again this year maintained its title to be called a wet month; the hay unsecured in July is still out, and of course in bad condition; the potatoe blight is making rapid progress; from the present appearance of the weather I fear the Highlandman must look forward to his usual harvest month (October) for weather for securing his crops. This month has done good in giving a plentiful supply of water, which was much needed from the dryness of the previous months; this Island is still healthy, except scarlatina amongst children.

LOCHBROOM.—Heavy wind on 3rd and hurricane on 4th both from N. August commenced rather unlike harvest weather, but on the 11th the weather became really autumnal, and since has continued propitious for "shearing" and ripening; the harvest is likely to be early for this country; the best farmers are already housing, and the later portions are whitening beautifully; the potatoes are excellent and free from blight and the turnip crop magnificent.

SANDWICK.—Gale (40 miles an hour), 3 p.m. 4th to 3 p.m. 5th.

IRELAND.

KILLALOE.—A remarkable prevalence of violent winds.

MONKSTOWN.—On almost every day this month more or less rain fell. The weather as a whole was cold and unfavorable for the harvest; max. having been 72° on the 24th and 26th; Bar. low, only above 30 in. on 10th & 14th; the gales of the 3rd, 4th, and 7th unusually severe for the season, and some injury done to the trees. H on 9th; very dense fog on 21st & 22nd.

DOO CASTLE.—A regular down-pour of R the whole of this month, the oat crop as a general rule as green as a leek. Hay which was cut at the beginning of the month is still unsaved, and low-lying meadows by the side of rivers have been inundated. The letter of Lord Portarlington which appeared in the papers about the middle of the month, stating that certain "indications" were in favour of fine weather up to the middle of September, has not been borne out, and farmers, to allay whose fears about the weather it was inserted, have been disappointed; T on evening of 25th.

OWENDOON.—The potatoe blight has shown itself very generally but not severely. The constant wet seems likely to have injurious effects on the harvest.

WARINGSTOWN.—Cold, showery, and unseasonable, with the exception of a few days in the last week; crops late; and the harvest much delayed.

LECKPATRICK.—Half the rain fell in the first eight days; a wet month and unfavorable for harvest, which should be in full progress.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

IX.] OCTOBER, 1866. [PRICE FOURPENCE, or 5s. per ann. post free

ON THE FALL OF RAIN IN SEPTEMBER, 1866.

The rainfall of the past month has been, in the greater part of England, so exceptionally heavy, that it would well have merited special notice, even had there been no national and material interests involved; but when we are told, on high authority, that towards the close of the month each day's rain caused injury to the amount of nearly half-a-million sterling, it indeed behoves us to place the facts before our readers as fully and clearly as we can. Obviously the results of the comparatively few returns yet received *may* be modified when the whole are collected at the end of the year, but we anticipate amplification, not reversal of the indications afforded by the following tables.

Table I. is a continuation for the subsequent three months of 1866 of that given in *Meteorological Magazine*, No. VI. *p.* 58, whence the general distribution of rain during the present year may readily be seen; the leading facts being that the fall in the first six months has been nearly doubled by the subsequent three, and the nine months have had nearly (in some cases more than) 12 months' supply.

Table II. requires no explanation, and few remarks; the one most striking fact being the presence of the Devonshire returns amid and even above those from Westmoreland and Wales; and in fact the general reversal of ordinary position, consequent, as will be seen hereafter, on the *relative* excess having been less in the districts of (ordinarily) greatest rainfall.

Table III. is arranged with a view to showing the districts where the excess had been most remarkable; that is to say, where the proportion of the excess to the mean fall was the greatest. Perhaps we may be excused for elucidating this point, since we have been requested to do so on a previous occasion. In Table III. it will be seen that at Taunton the fall was 5·22 inches above the average, and at Goodamoor it was 9·75 inches above; yet the lesser excess is placed above the greater; it is so for this reason—viz., the total at Taunton is 6·88, and the excess is 5·22, hence the mean there is 1·66; then 5·22 is 4·13 times the average; but 9·75 at Goodamoor will be found to be only 3·09 times the average.

The design of this table being to show where the fall was most remarkable and unusual, the returns have been grouped in the order of decreasing relative excess, until indeed the last two stations had less than their average, Portree, in the Isle of Skye, having only 84 per cent. of its average, and Sandwick, Orkney, only 72 per cent.—a wonderful contrast to the fall in the south, where it was generally double

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the average, in some places threefold, and at one is returned as more than four times the average.

TABLE I.—Rainfall in the first Nine Months of 1866.

STATIONS.	Total of first 6 months.	July.	Aug.	Sept.	Total of 9 months.	Average. 1860-65.	Difference.
England & Wales.							
Camden Town	17·08	1·19	2·76	3·89	24·92	18·51	+ 6·41
Linton Park	16·95	2·73	2·15	4·25	26·08	19·17	+ 6·91
Selborne	21·60	1·38	2·66	6·52	32·16	22·62	+ 9·54
Banbury	12·35	2·08	3·52	5·63	23·58	18·94	+ 4·64
Culford	14·30	2·25	3·39	3·01	22·95	17·01	+ 5·94
Goodamoor	28·46	2·42	6·52	14·40	51·80	39·12	+12·68
Barnstaple	18·22	2·60	3·99	7·07	31·88	28·14	+ 3·74
Taunton	17·00	1·79	1·65	6·88	27·32	19·16	+ 8·16
Shrewsbury	11·88	1·61	4·36	5·19	23·04	19·03	+ 4·01
Orleton	16·75	2·17	2·99	6·68	28·59	22·40	+ 6·19
Wigston	10·95	2·21	4·41	5·43	23·00	18·12	+ 4·88
Derby	12·47	2·41	6·56	4·79	26·23	19·13	+ 7·10
Manchester	14·22	4·31	5·12	7·13	30·78	24 74	+ 6·04
York	9·69	2·91	3·06	4·04	19·70	17·09	+ 2·61
Arncliffe	30·25	5·24	5·33	11·19	52·01	38·74	+13·27
N. Shields	10·05	3·70	3·24	3·60	20·59	19·04	+ 1·55
Seathwaite	75·81	11·18	12·69	21·35	121·03	103·52	+17·51
Haverfordwest	26·24	1·55	5·00	9·51	42·30	31·48	+10·82
Cefnfaes	23·76	2·41	4·21	6·98	37·36	31·42	+ 5·94
Scotland.							
Dumfries	14·80	2·84	3·27	5·88	26·79	25·94	+ 0·85
Auchendrane	20·61	3·32	4·86	5·91	34·70	30·15	+ 4·55
Nookton	13·22	2·87	3·42	2·78	22·24	19·87	+ 2·37
Deanston	21·42	3·27	6·14	5·89	36·72	29·74	+ 6·98
Portree	45·00	3·90	7·84	9·11	65·85	51·34	+14·51
Sandwick	18·27	1·64	3·24	2·65	25·80	23·90	+ 1·90
Ireland.							
Waterford	19·23	·85	3·49	3·96	27·53	27·65	— ·12
Killaloe	25·58	1·96	4·55	6·47	38·56	33·30	+ 5·26
Portarlington	16·19	1·22	2·63	4·16	24·20	29·14	— 4·94
Monkstown	16·46	·89	2·22	2·70	22·27	21·40	+ ·87

TABLE II.—Rainfall in September 1866. Stations arranged according to amount.

The Stye, Borrowdale	22·62	Coniston	12·10
Seathwaite, ,,	21·35	,,	11·76
Sprinkling Tarn	19·80	Arncliffe, Skipton	11·19
Snowdon, Hafod-y-llan	18·48	Chepstow	10·57
Stonethwaite	17·83	Vicarage, Kirkby Lonsdale	9·92
Stye Head	17·44	Kendal	9·77
Beddgelert	16·71	Casterton, Kirby Lonsdale	9·76
N. Hessary Tor, Dartmoor	16·71	Haverfordwest	9·51
Rhiwbryfdir	16·37	Fort William, Inverness	9·43
Prison Reservoir, Dartmoor	15·05	Portree, Isle of Skye	9·11
Goodamoor, Plymouth	14·40	Belgrave, Sidmouth	8·87
High Close, Grasmere	14·35	Bolton-le-Moors	8·66
Mosedale	13·86	Lancaster	8·04
Abercarn, Monmouth	13·39	West Hoathly, Sussex	7·72
Llanberis, R. Victoria Hotel	13·05	Weymouth	7·54
Esk House	12·54	Presteign, Radnor	7·52
Tynant, Cardiff	12·50	Clifton, Gloucester	7·40
Dolgelley	12·46	Wainsford, Lymington	7·40
Cardiff	12·10	Shirley Warren, Southampton	7·34

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TABLE II.—(*continued.*)

Manchester	7·13	Highfield House, Nottingham	4·97
Riverhead, Sevenoaks	7·09	Cessnock Park, Glasgow	4·84
Marlborough College	7·07	Derby	4·79
Barnstaple	7·07	Ilkley, York	4·75
Cefnfaes, Rhayader	6·98	New Brighton, Liverpool	4·67
Galway	6·96	Logierait, Perth	4·43
Bath	6·89	Leckpatrick, County Tyrone	4·40
Taunton	6·88	Guildford, Surrey	4·36
Cranbrook, Kent	6·74	Cork	4·34
Orleton, Worcester	6·68	Linton Park, Kent	4·25
Calne, Wilts	6·66	Portarlington	4·16
Selborne, Hants	6·52	York	4·04
St. Lawrence, Isle of Wight	6·51	Waterford	3·96
Killaloe	6·47	Beadlam Grange, Yorkshire	3·95
Norton in Hales, Salop	6·47	Mill Hill, Hendon	3·95
Kingham, Chipping Norton	6·10	Killingholme, Lincoln	3·93
Knaptoft, Rugby	5·98	Camden Town	3·89
Ayr	5·91	Waltham Abbey, Essex	3·83
Deanston, Stirling	5·89	Inisnag, County Kilkenny	3·66
Dumfries	5·88	North Shields	3·60
Northampton	5·85	Boston, Lincoln	3·55
Malvern	5·79	Waringstown, County Down	3·48
Banbury	5·63	Hawick, Roxburgh	3·43
Lochbroom, Rosshire	5·62	Twickenham	3·42
Hythe, Kent	5·54	Staines	3·41
Braystones, Whitehaven	5·39	Culloden, Inverness	3·07
Hereford	5·30	Culford, Bury St. Edmunds	3·01
Glasgow	5·21	Aberdeen	2·99
Doo Castle, Sligo	5·20	Middlesboro'-on-Tees	2·96
Shrewsbury	5·19	Hillington, Norfolk	2·89
Broomsgrove	5·17	Ballater	2·83
Bromley Common, Kent	5·15	Wisbech	2·79
Great Missenden, Bucks	5·15	Monkstown, Dublin	2·70
Owendoon, County Cavan	5·13	Sandwick, Orkney	2·65
Auchterarder, Perth	5·00	Sutton Park, Bedfordshire	2·40
Markree, County Sligo	4·97	Helmsdale, Sutherland	2·30

TABLE III.—Rainfall in September, 1866, compared with the mean in September, 1860-65.

[Stations in order of greatest relative excess, *i.e.*, showing by their sequence where the excess has been most remarkable.]

Stations.	Total.	Excess.	Ratio. Mean100	Stations.	Total.	Excess.	Ratio. Mean100
Taunton	6·88	+5·22	414	Culford	3·01	+1·40	187
Goodamoor	14·40	9·75	309	Cefnfaes	6·98	3·14	182
Clifton	7·40	4·79	284	Bolton	8·66	3·77	177
Selborne	6·52	4·08	267	Coniston	12·10	5·24	176
Haverfordwest	9·51	5·80	256	York	4·04	1·70	173
Orleton	6·68	3·99	248	Camden Town	3·89	1·63	172
Banbury	5·63	3·26	237	Auchterarder Ho.	5·00	1·95	164
Shrewsbury	5·19	2·99	236	Seathwaite	21·35	8·14	162
Arncliffe	11·19	6·23	226	Ayr	5·91	2·18	158
Dumfries	5·88	3·15	215	Cessnock Park	4·84	1·77	157
N. Shields	3·60	1·90	212	Killaloe	6·47	2·31	155
Derby	4·79	2·44	204	Monkstown	2·70	·71	135
Broomsgrove	5·17	2·57	199	Portarlington	4·16	·88	127
Manchester	7·13	3·43	193	Waterford	3·96	+ ·83	126
Linton Park	4·25	2·03	191	Portree	9·11	—1·66	84
Barnstaple	7·07	3·30	187	Sandwick	2·65	—1·01	72
Deanston	5·89	+2·74	187				

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Not having yet received the returns of rainfall in September from our French correspondents, we are only able to mention the not generally known fact, that many of the Departments have suffered severely from the inundations caused by the excessive rains of the past month.

The *Journal de la Nièvre* says :—

"We regret to learn that the inundations of the Seine have seriously affected one of the most important industries in the department of the Nièvre—the commerce in wood. The floods took place at the moment when the supply for Paris was in process of collection, and the greater part has been carried away by the waters. The damage is immense. Such a disaster has not occurred since 1836."

A letter from Paris, dated October 5th, says :—

"The waters of the Seine, that had been falling for the last few days, showed a slight ascensional movement yesterday. The level of the river marked only 4 metres 70 centimetres on Wednesday, but yesterday it stood at 4 metres 80, by the graduated scale of the Pont Royal. There is every reason to believe, however, that this fluctuation will be but slight, as it is very probable that the inundation has done its worst. It must not be supposed, however, that the amount of actual mischief done will have any great effect upon the general prosperity of the country. Many of the departments have not suffered in the least, and in those that have been most exposed to the water only a very small portion of the soil has been rendered unfit for the autumn sowing. In fact, the disasters may be said to be entirely local, almost like those produced by hail and other storms, which seldom produce any great deficit in the total of the country's produce. The rise, therefore, that has just taken place in bread and other necessary articles of consumption, appears to me scarcely justified, and it is very probable that there will be a corresponding fall, especially if the weather should turn out fine enough to allow the October sowing to be proceeded with without interruption. As regards the poorer classes of sufferers, the appeals for aid undertaken by the authorities are being pretty generously responded to, and already more than 200,000f. has been collected."

It is satisfactory to be able to add that October has hitherto been characterized almost universally by weather the opposite of September —viz., high barometer and no rain. It is rather worth noting, that this year has been in marked contrast to 1865 in many points—especially that September, 1865, was as remarkably dry as 1866 was wet, and that at present October bids fair to be as dry as October, 1865, was wet.

We need hardly say that this change has been of incalculable benefit to the farmers, reports from all parts bearing uniform testimony.

HARVEST OF CANADA.

The Grand Trunk Railway Company have made their usual collection of reports on the harvest from the various districts through which the railroad passes. The *Montreal Herald* states the result as follows:—"These reports show the truth of the opinion generally formed, that while the appearance of the harvest in the early part of the season was remarkably fine, the excessively wet weather has to a great extent frustrated the hopes of the cultivator, except in the extreme west, where the grain ripens early. The further we come eastward the worse appears to be the position of affairs. Thus in place of the abundance which was reasonably anticipated at Midsummer, we fear that we can hardly expect an ordinary average crop throughout the country." The *Toronto Globe* says :—"It will be seen that, notwithstanding the unfavourable harvest weather of the past month, the crops generally may be said to be good. The injury caused by the rain has not been so great in the Western portion of the province as in Central and Eastern Canada. When the wheat is thrashed Canadian farmers will have no reason to complain. The coarse grains are far above the yield of past years. Barley a good yield, but of a very poor colour, owing to the rains. On the whole, although the extravagant anticipations of Midsummer are not realized, the gloomy forebodings of the earlier part of the season are still further wide of the mark."

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RAINFALL IN SEPTEMBER, 1866.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground		Above Sea Level.	Depth of Rain. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which ·01 or more fell.
			ft.	in.	feet.	inches.	inches.	inches.		
I.	ENGLAND.	Camden Town	0	6	100	3·89	+1·63	·47	21	22
II.		Staplehurst (Linton Park)	0	6	296	4·25	+2·03	·81	8	23
,,		Selborne (The Wakes)	4	0	500 ?	6·52	+4·08	·82	4	27
III.		Hitchen	2	0	240	2·63	+ ·77	·31	9	24
,,		Banbury	7	0	345	5·63	+3·26	·94	4	27
,,		Wisbech	0	6	10	2·79	...	·45	4	19
IV.		Bury St. Edmunds (Culford)	1	2	...	3·01	+1·40	·52	8	21
V.		Calne	0	11	250	6·66	...	·77	4	27
,,		Plymouth (Goodamoor)	0	2	580	14·40	+9·75	1·74	5	27
,,		Barnstaple	0	6	31	7·07	+3·31	1·05	4	30
,,		Taunton (Fulland's School)	1	4	...	6·88	+5·22	·94	5	27
VI.		Shrewsbury (Highfield)	5	6	200	5·19	+2·99	1·00	28	19
,,		Tenbury (Orleton)	0	9	200	6·68	+4·00	·97	29	29
VII.		Leicester (Wigston)	0	6	220	5·43	+3·22	·65	4	24
,,		West Retford	0	6	50	...	...	...	...	...
,,		Derby	5	0	180	4·79	+2·45	·51	16	27
VIII.		Manchester	2	7	106	7·13	+3·43	1·15	5	25
IX.		York	0	6	50	4·04	+1·71	·51	6	27
,,		Skipton (Arncliffe)	3	0	750	11·19	+6·23	·95	21	26
X.		North Shields	1	0	124	3·60	+1·90	·76	8	22
,,		Borrowdale (Seathwaite)	1	0	422	21·35	+8·14	3·30	21	29
XI.	WALES.	Abercarn	1	3	450	13·39	...	1·83	4	26
,,		Haverfordwest	2	0	60	9·51	+5·80	1·00	7	23
,,		Rhayader (Cefnfaes)	2	0	880	6·98	+3·14	·85	6	27
,,		Llanberis (R. Victoria Hotel)	1	0	370	13.05	...	1·96	10	24
XII.	SCOTLAND.	Dumfries	0	5	70	5·88	+3·15	·71	28	26
,,		Hawick (Silverbut Hall)	4	0	512	3·43	...	·97	28	25
XIV.		Ayr (Auchendrane House)	2	3	94	5·91	+2·17	1·23	20	23
XV.		Otter House	0	6	130	...	...	..	...	...
XVI.		Leven (Nookton)	0	6	80	2·73	+ ·25	·41	18	21
,,		Stirling (Deanston)	0	0	130	5·89	+2·74	·93	18	22
,,		Logierait	1	0	250	4·43	...	·70	28	19
XVII.		Ballater	0	10	656	2·83	...	·68	28	16
,,		Aberdeen	4	8	115	2·99	...	·45	28	22
XVIII		Inverness (Culloden)	3	0	104	3·07	...	·52	14	15
,,		Fort William	0	8	20	9·43	...	1·54	18	26
,,		Portree	0	4	60	9·11	—1·66	1·45	20	24
,,		Loch Broom	0	8	48	5·62	...	·90	20	20
XIX.		Helmsdale	1	0	34	2·30	...	·42	14	16
,,		Sandwick	2	0	78	2·65	—1·01	·50	2	14
XX.	IRELAND.	Cork	6	0	65	4·34	...	·57	15	28
,,		Waterford	4	0	60	3·96	+ ·83	·49	9	25
,,		Killaloe	5	0	128	6·47	+2·31	·74	10	24
XXI.		Portarlington	9	0	236	4·16	+ ·88	·71	7	27
,,		Monkstown	0	6	100	2·70	+ ·71	·65	9	21
XXII		Galway	6	0	25	6·96	...	·93	14	24
,,		Bunninadden (Doo Castle)	1	0	...	5·20	...	·90	20	27
XXIII		Bawnboy (Owendoon)	1	3	218 ?	5·13	...	·82	13	24
,,		Waringstown	0	4	191	3·48	...	·50	18	23
,,		Strabane (Leckpatrick)	0	5	260	4·40	...	·85	13	22

+ Shows that the fall was above the average ; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail.

ENGLAND.

CAMDEN TOWN.—T S and H with rainbow and bright sunshine, all at the same time, from 5.15 to 5.30 p.m., on 2nd; Fog on 25th.

LINTON PARK.—T on the 8th, and more distantly on 23rd; heavy R on both occasions. The whole month wet and often windy, contrasting strongly with September, 1865. R on 23rd caused a slight flood in the rivers; the last three days fine and dry. Harvest operations much retarded where not completed in August, and hop-picking (an important affair in this county) has also proceeded under difficulties. Wind mostly S., S.E. and S.W., the last day the hottest in the month.

SELBORNE.—The almost incessant rain rendered it impossible to get in the corn, much of which is damaged, as are also some of the hops. L on 2nd. T on 6th, 17th, and 20th. Aurora on 15th and 16th.

BANBURY.—T S and H at 3.15 p.m. The wettest month since October, 1852. Harvest not yet complete. Max. 67°; min. 36°.

WISBECH.—H, L, on 2nd; T at 3 p.m., L at 8 p.m. on 15th. Gale, 7 lbs., on 11th. This was a dull wet month, the air frequently saturated (mean degree of humidity 93·7); the harvest work was much retarded; oat and pea straw much injured.

CULFORD.—T on 6th; max. 73° on 30th, min. 38° on 17th and 24th. One of the wettest Septembers on record in this locality.

CALNE.—Storms with T in N. on 2nd; R fell on every day, but less than ·010 on 19th, 22nd and 24th; stormy on 2nd, 5th, 6th, 10th, 11th, 14th, 15th and 21st. T S with H at 3 p.m., on 16th.

GOODAMOOR.—Fog 18th; stormy on 2nd, 4th, 5th, 6th, 9th, 13th, 14th, 15th and 18th; max. 72° on 30th. Total rain more than ever recorded except in November, 1852 (=15·54).

TAUNTON.—Max. 81°·5 on 28th. Rainfall throughout the month, except on 15th, 18th, and 20th; T S on 5th, 8th, and 23rd, the T on 8th being particularly sharp. The warm showers have produced luxuriant pasturage. Development of various fungi: mushrooms in abundance where never before noticed.

ORLETON.—T on 5th. A perfect contrast in all respects to this month in 1865, when R fell only on 2 days, and the sky was frequently cloudless. In this month R fell on every day but on 14th it was under ·01; there was very little sun, but generally a clouded sky, and rough changeable winds, and the temp. below the average; max. 66°·5 on 4th, min. 35°·5 on 23rd; bar. low throughout. This month's rainfall has been exceeded only five times in 36 years:—viz., July 1834=9·23 (with T S S), September 1852=7·07; November 1852=8·22, June 1860=7·25, July 1861=6·69. Brooks and rivers flooded at the end of the month.

DERBY.—Another unusually wet month, the rainfall for September and August being 11·35. For the last 9 weeks the bar. has been below 30 in., but it is now slightly above that reading.

MANCHESTER.—Since 1794 there has been no September with a rainfall anything like that of the present year. We may almost say we have had incessant R.

ARNCLIFFE.—One of the most continuously rainy months I have ever registered, and considerably more than double the average.

NORTH SHIELDS.—T on 2nd. Extremely cloudy and damp with very little sunshine.

SEATHWAITE.—R on every day except the 9th; more than 3 in. fell on the 21st, and nearly 3 in. on 11th, more than 2 in. on 3 days, and more than 1 in. on 7 days, in fact 13·58 in 7 days=1·95 each day and ·71 for each in the month, and yet from the prevalence of wind, the evaporation has been considerable and the corn harvest has suffered but little, though the potatoe crop is severely injured.

WALES.

ABERCARN.—Stormy on 10th, 16th, and 18th. Winds westerly till 17th, then southerly to the end. So wet a September has not been known for many years; the crops rotting on the ground, it being impracticable to haul them in.

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HAVERFORDWEST.—The most stormy and disastrous September of which I have any record (during 17 years). Harvest operations much impeded by the continued heavy rains, and furious gales which prevailed almost without intermission till the 21st. T S on 23rd, at 5 p.m.

CEFNFAES.—A continuance of R, and occasionally gales of wind, chiefly from the S.W. ; there has not been an entire day and night without R, since the 27th August. Temp. cold for the season ; crops of grain of all kinds very seriously injured ; potatoe disease very much increased.

SCOTLAND.

DUMFRIES.—T on 1st; the month one of the wettest for above 17 years; harvest very protracted. Temp. low, being 6°·24 below that of last September; Bar. 30·13, on 30th, being the first time it has reached 30 in. since July 26th.

SILVERBUT HALL, HAWICK.—The coldest, wettest, windiest, and dullest September we have had here for many years. The turnips and mangold wurzels, those unamiable crops, which will not thrive in pleasant weather, have a most luxurjant appearance; but there are doleful complaints about the prevalence of the potatoe disease, and all the corn crops (of which there are still many fields to cut) have suffered more or less from the drenching R.

AUCHENDRANE.—High floods in the river on 20th, at 7 p.m. Although the rainfall has been excessive, the moderate temperature, and brisk winds have combined to protect the grain crops from injury.

DEANSTON.—T on 1st; very dull and wet. Grain crops not all secured at the end of the month, and some even not cut in the higher lands.

LOGIERAIT.—A very wet month ; much corn still ungathered.

BALLATER.—Aurora on 16th ; beautiful lunar rainbow on 18th ; gale on the 25th; a fir tree uprooted thereby. In consequence of the backwardness of the weather, the harvest is much later than last year, and much of the corn is mixed up with a second growth.

ABERDEEN.—T S 1st and 2nd ; a dull, close, wet, unseasonable month ; humidity 10 per cent. in excess of mean of last 10 years; wind rather below the mean; ozone very deficient. Aurora on 7th, 13th to 17th, 19th, and 21st.

CULLODEN.—Fog on 29th. Aurora on 16th. Lunar rainbow, 7 p.m. on 26th.

FORT WILLIAM.—Fresh snow on Ben Nevis on 14th, and again on 21st; T on 25th.

PORTREE.—T on 2nd, & T S with heavy hail showers on 21st ; solar halo on 4th ; lunar halo on 21st and 27th. Gale on 25th ; frost on 4th and 18th. No harvesting could be done during the month, so that the crops are in bad order, but the farmers have great hopes of October, and at present it looks well for the gathering in of the crops. Scarlatina still continues; people of all ages, including a great number of children, have died from it, otherwise the island is healthy.

LOCHBROOM.—Gale on night of 9th ; T on 10th, and stormy on 11th ; from the 17th to the end, R on every day except the 24th, 25th, and 26th. The weather was warm but unpropitious for the housing of crops which are now, notwithstanding, safely secured except in a few cases. The rainfall was in excess of the six preceding months, causing much anxiety to the farmer. Turnips are luxuriant, but signs of the disease are appearing.

SANDWICK.—T and heaviest fall of R on 2nd. Aurora on 7th, 8th, 15th, 18th, and 19th. Rainfall below the average, and below the mean of August, indeed it generally is so, as this is our little summer. The R in a series of years increases from the min. in May to the max. in October, with this exception in September. This last month and indeed all the summer has been fine in Orkney, so that a great part of the crop has already been secured in excellent condition, while much damage has been done in many southern parts of Britain.

IRELAND.

KILLALOE.—Storms on the 9th, 10th and 11th, all leaves and young branches exposed to these winds were completely blasted, the other side of the tree remaining green ; violent wind again on 21st. The wettest September in 21 years except two, 1859=6·83 and 1861=7·57.

MONKSTOWN.—R frequent but slight ; frost on 3 or 4 nights, Min. 28° on grass on 22nd ; 9th, 10th, and 11th, very wild weather, culminating in a terrific gale on the 11th.

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DOO CASTLE.—Strong gale on 11th. In consequence of the persistent rainfall, all farm produce has been injured; I have been told, and by a very competent authority, that it will show a falling off of between a third and a half. About 5 miles from hence, a tropical shower fell on the 14th, which literally tore up the road and formed a rapid stream in 20 minutes. Last 3 days of the month very fine.

OWENDOON.—High winds on 9th & 10th. Reaping commenced on 18th. The constant wet greatly retarded all farming operations this month, and the whole country was beginning to despond; the weather, however, seemed to improve with the full moon on the 23rd, and we are in hopes that little damage is done, except on the flooded districts.

WARINGSTOWN.—T S with H at 3 p.m. on 15th; T shower very cold on 21st. Wet, stormy, and cold; such weather has rarely been experienced during the harvest in this district, but from the cold high winds, the damage to grain from sprouting has not been as great as might otherwise have been expected.

LECKPATRICK.—Very wet month; incessant R from the 10th to the 22nd; very unfavorable for harvest operations.

BELTON VICARAGE, LOUGHBOROUGH, *Sept. 19th*, 1866.—SIR,—I send you the following extract from my rainfall register, seeing from the Magazine that you have not hitherto had any figures so high communicated to you for August 28th. From 8·30 a.m. August 28th, to 8·30 a.m. August 29th, 2·84 in.: but from noon August 28th, to noon August 29th, 3·01 in.; total for August, 5·52 in. Your obedient servant,—R. DALBY.

EARTHQUAKE AT BUDLEIGH, SEPTEMBER 13TH.

To the Editor of the Meteorological Magazine.

DEAR SIR,—The enclosed letter is from the *Exeter Gazette*. The sensation felt by the writer was, that somebody was shaking the shutters from outside. East Budleigh is 4 miles W. of Sidmouth. I cannot find that it was felt or noticed here, but a gentleman told me he distinctly felt it at Branscomb, 4 miles E. of Sidmouth. Barometer 29·740 Ther. 62°·2. Truly yours,

Belgrave, Sidmouth. J. INGLEBY MACKENZIE, M.B. Cantab, F.M.S.

P.S.—Our average annual rainfall here is about 28 inches; up to September 30th this year I have registered 30·35.

To the Editor of the Exeter and Plymouth Gazette.

SIR,— Two distinct shocks were felt here at a quarter to ten on Thursday night. The windows of my house rattled violently. About five minutes elapsed between the two shocks, and the last was the more violent of the two. I believe that the cause was an earthquake. The night was quite calm at the time.

Your obedient servant,

East Budleigh, September 14th, 1866. R. H. LIPSCOMB.

METEORS.

KING'S CROSS, HALIFAX.

September 1st, 8.45 p.m. local time.

Meteor in S., first seen 10° above horizon, a little E. of Jupiter and below him; moved steadily in an upward slanting direction towards S.S.W.; distance moved, about 20°; left a train of light; path, a straight line; burst into fragments; no noise. The Meteor itself and the fragments were deep red. Time, about 3 seconds. Sky dull on horizon; very many stars near zenith; wind low, and from S.S.W.

JOSEPH GLEDHILL, F.M.S.

To the Editor of the Meteorological Magazine.

SIR,—It may interest some one to know that as I was driving from Shap to Penrith, on the evening of the 27th of September, I saw a very fine Meteor, pale yellow, start from a point under the Pole Star and travel horizontally and slowly above the two upper stars in the Great Bear, fading away above Arcturus; its train was visible for some seconds, and was brightest in the middle of the track. The Meteor was brighter than Jupiter, which was shining at the time. I had no lights and could not see my watch; I should think it might be a quarter to eight, but you can ascertain the time the moon rose that night, and put the Meteor a quarter of an hour earlier. Yours, &c., T. H. F.

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RAINFALL INVESTIGATIONS IN FRANCE.*

IT must be a source of great pleasure to all interested in the progress of rainfall inquiries, to find other nations taking up the subject with great energy; and that there is reason to hope, ere very long, that a thorough interchange of results may be of equal interest and utility to Meteorologists and Engineers in this and other countries. We cannot better illustrate the developments recently given to such inquiries, than by noticing the works enumerated at the foot. Professor Raulin's splendid monograph has long awaited that full and detailed notice which it merits, and our limited space precludes. The introduction gives a running narrative of the establishment of rain gauges at the various places in the south west of France; then follows Part I. devoted to observations, those from each station being preceded by full particulars of the size of the gauge, its height above ground and above the sea, where the observations have been taken, and by whom, also (if published) in what works they have been printed; then follow tables giving the total fall in the civil year, and in each month thereof, in each meteorological quarter, and year (*i. e.*, December 1 to November 30) also if the register embraces many years, an abstract in decennial means, and means, max. and min., of the whole period. Of course all these details are not always known, but their completeness may be estimated from their occupying over 200 pages of closely-printed matter. An appendix to the first part, by M. Abria, deals with the principal causes of differing results obtained at contiguous stations. Speaking of the relative rainfall indicated by large and small gauges, M. Abria remarks, "observations continued during a year with two gauges whose receiving surfaces were nearly as 20 to 1, have given almost identical results, not only in the totals, but even in the monthly values, which generally differ very slightly, the excess being sometimes on one side, and sometimes on the other." From the table we find that his gauges were respectively 4½ and 20 inches in diameter; during the year the large gauge collected

* *Observations Pluviométriques faites dans le Sud-Ouest de la France (Aquitaine et Pyrénées) de* 1714 *a* 1860, *suivies des grandes séries de Montpelier, Paris, Genève et le Grand-Saint-Bernard et des resultats de quelques Observations Pluviométriques par M. Abria.* Par M. RAULIN, Professeur de Géologie à la Faculté des Sciences de Bordeaux. 1864. Paris: F. Savy, Rue Hautefeuille, 24. 1 vol. 8vo, 320 pp.

Commission Hydrométrique et Commission des Orages de Lyon, 1865—22e *Année. Résumé des Observations receuillies dans les Bassins de la Saone, du Rhone et de quelques autres Régions Accompagné de Notices diverses.*

Tableau Comparatif des Observations Pluviométriques faites dans le Sud-Ouest de la France en 1865. Par M. V. RAULIN. Bordeaux, 1866.

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31·54 in., and the small one 31·02. The second portion of Professor Raulin's work is devoted to comparisons and deductions of great interest.

The next work to claim notice, is the twenty-second report of the Hydrometric Commission of Lyons, and as all our readers may not be aware of the objects and duties of this body we may briefly mention that built as Lyons is, almost level with the Saône and the Rhône, which there unite their streams, it has always been very liable to destructive inundations. About 20 years since, it was resolved to establish rain gauges at different points in the upper watersheds of the rivers and endeavour from their indications to compute the height to which the river would probably rise; this has long been accomplished: each flood anticipated by several hours, by public notice of its approach, and the probable height to which the water will rise on certain of the bridges; so that the valuable merchandize for which the city is so famed may be removed above the line of danger. This we believe to have been the original purpose of the Commission, but its talented president has wisely not confined himself to this narrow field, but in successive volumes has published a series of articles on the meteorology and hydrology of the district of high interest. That just received may be taken as a fair type of its predecessors, and we therefore epitomize its contents.

1. Abstract of meteorological observations in 1865; the most remarkable feature being the high temperature, every month being above the average, and the mean of the year (56°·3 F) 3°·8 F above the usual mean (52°·5 F). The hottest year previously was 1859 (55°·2 F). This heat has permitted the various crops to ripen perfectly, and the vine especially has yielded magnificent produce.

Following these introductory remarks, are the monthly rainfall returns from the undermentioned stations; we add the total fall in 1865 at each, remarking, *en passant*, that at scarcely any Station was there a drop of rain in September.

WATERSHED.	STATION.	Height above Sea. feet.	Depth of Rain. inches.
Bassin de la Saone Supérieure	Courlon	1090	31·9
	Vesoul	784	20·6
	Gray	768	22·4
	Dijon	869	21·5
Bassin de la Saone Inférieure	Châlon	594	20·7
	Lons-le-Saulnier	856	15·1
	Bourg	919	39·0
	Fort Lamotte	597	31·0
Bassin du Doubs	Fort de Joux	3281	35·7
	Montbéliard	1273	47·9
	Besançon	1191	30·1
	Dôle	752	25·8
Bassin de l'Ardière	Monsol	1926	34·2
	Cercié	755	30·7
Bassin de l'Azergues	St. Nizier d'Azergues	1309	26·8
	St. Laurent d'Oingt	1810	28·6
Bassin de la Brevenne	Tarare	1312	30·9
	L'Arbresle	742	27·7
	Ste-Foy-l'Argentière	1418	30·4
	Duerne	2703	27·2

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WATERSHED.	STATION.	Height above Sea. feet.	Depth of Rain. inches.
Bassin du Rhône	Givors	502	31·6
Bassin du Rhône Supérieur	St. Bernard	8173	43·7
	Genève	1221	28·2
	Les Rousses	3645	48·0
Bassin du Rhins	Cublize	1525	29·6
Littoral Méditerranéen	Marseille	158	17·3

Daily observations at Lyons Observatory, and a sheet of curves, somewhat like Mr. Cator's Weather Diagram (see *Meteorological Magazine*, vol. i. p. 26) are followed by tables showing the daily rainfall at each of the stations just named, and also the direction of the winds, with remarks on thunderstorms and other occasional phenomena. Tables of the daily height of the Rhone at Pont Morand, from 1826 to 1855, and their careful analysis, occupy very many pages; and the report closes with a paper by M. Fournet, to which he merely gives the unassuming title of "*Documents relatifs à la Commission Hydrométrique et a celle des Orages*," but which is really a masterly epitome of the progress of Meteorology and Hydrology in France, with articles on their relations to health, agriculture, geology, and water supply, analyses of the rivers and the chemistry of the atmosphere, to which we hope to recur on a future occasion.

The last work we have to notice is, in fact, a *British Rainfall* on a small scale; and here we have to congratulate Prof. Raulin on the increasing completeness of the geographical distribution of his stations, while we cannot but regret the absence of columns specifying the height of the gauges above the ground, and above the sea. We have in the following conversion of his results into English measures, supplied the deficiency from the previously mentioned large work, but obviously it is *possible* the heights may have been altered.

RAINFALL OBSERVATIONS IN THE SOUTH-WEST OF FRANCE, 1865.

STATIONS.	Height of Gauge. Above Ground.	Above Sea.	Depth of Rain.	STATIONS.	Height of Gauge. Above Ground.	Above Sea.	Depth of Rain.
	feet.	feet.	inches.		feet.	feet.	inches.
Paris (Terrace)	89	279	18·9	Bordeaux (Fac. of Scs.)	32	62	30·0
,, (Courtyard)	0	190	19·8	,, (M. Petit Lafitte)	29	62	34·6
Aquitaine North-West, or Charentaise.				,, (Mil. Hosp.)	...	..	35·3
Poitiers	...	...	32·3	Bouliac	0	213	36·4
Melle	...	...	24·3	Cadillac	10	46	32·4
Comporté (near Niort)	...	...	32·7	Langon	10	158	31·9
Courçon	14	33	31·5	Col-de-Fer	13	75	25·2
Marans	...	21	31·9	Lavallade	...	656	23·9
La Rochelle (P.-et-Ch.)	5	18	33·6	Fumel	43	551	27·5
,, (Mil. Hosp.)	...	...	29·6	Villeneuve	...	...	28·0
St. Jean d'Angély	16	56	34·4	Agen (M. Magen)	26	174	30·2
Rochfort	4	21	34·9	,, (P.-et-Ch.)	7	184	28·9
Royan	...	16	30·3	Sos	...	427	21·3
Montguyon	23	325	37·4	Auch	...	...	39·9
Confolens	2	428	39·5	Mount-de-Marsan	7	138	30·2
Aquitaine West, or Bordelaise.				Beyrie	30	338	39·3
Arcachon	...	...	30·8	Peyrehorade	23	46	42·7
Bordeaux (Eta. Paulin)	...	...	38·0	St. Martin-de-Hinx	...	...	56·8
,, (Botanic Gard.)	...	...	38·8	Bayonne (P.-et-Ch.)	...	...	45·2

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Bayonne (Mil. Hos.)	...	...	51·6
Aragori	...	...	75·8
Lescar	...	...	37·9
Peyranère	3	4645	69·1
Bagès-Béost	5	2204	34·5
Bagnères-de-Bigorre (P.-et-Ch.)	6	1782	59·0
,, ,, (M. Lyte)	...	...	51·5
Aquitaine East, or Toulousaine.			
Cahors	...	459	25·9
Figeac	...	738	26·0
Montauban	10	285	22·0
Verriès	27	266	22·9
Toulouse (Canal Office)	12	491	23·4
Muret	3	541	25·8
Aurignac	2	1070	16·8
Montréjeau	34	1549	39·5
Bagnères-de-Luchon	8	2044	42·3
St. Girons	30	1316	24·1
Couflens	26	2343	29·2
Boussenac	25	3176	60·1
Le Fossat	30	816	29·9
Le Mas-d'Azil	36	994	32·5
Royat	30	873	24·0
Foix	46	1306	34·5
Ax	43	2405	30·5
Mirepoix	30	1020	24·7
Belesta	46	1650	31·9
Aurillac	...	4394	43·9
Saint-Flour	...	2898	27·1
Saint-Chély	...	3215	27·8
Marvejols	...	2100	26·1
Mende	...	2426	28·0
Montmirat	...	...	21·3
Florac	...	...	33·7
La Blaquière	20	2645	22·9
Rodez	...	..	20·5
Carmaux	27	797	26·3
Albi	36	590	28·6
Castres	13	572	19·2
Alban	27	2097	32·9
La Salesse	21	3630	28·8
Casternaudary	...	610	15·6
Carcassone	31	369	27·2
Limoux	...	538	20·1
Quillan	...	...	26·1
Appendix, Mediterranean,			
Sallèles d'Aude	...	39	21·7
Narbonne	...	43	19·7
La Nouvelle	20	30	17·5
Perpignan (Norm.Sch.)	...	...	20·4
,, (Mil. Hosp.)	...	...	17·5
Amélie-les-Bains	...	...	31·1
Montpellier (Faculty of Sciences)	...	...	28·3
,, (Bot. Gard.)	3	97	30·4
Appendix, Alps.			
Genève	..	1335	28·2
Grand St. Bernard	...	8173	43·7

THE YORKSHIRE RAINFALL.

To the Editor of the Meteorological Magazine.

DEAR SIR,—I observed with some surprise that the rainfall recorded on the 29th August at those places where the floods were most severe scarcely exceeded, if at all, the fall measured here, where there was little or no flood. A gauge 6 in. above ground measured 2·11; another at 1 ft. 2·05, and a third (12 in.) at 5 ft. 1·91, between 9 a.m. on the 29th, and 9 a.m. on the 30th; but between 7 a.m. on the 29th, when the rain began, and 7 a.m. on the 30th, the fall at 6 in. from the ground was 2·4 in. The rain was less heavy in the west, and even in Borrowdale, where I was at the time, could not, I should fancy have much exceeded an inch.* This accounts for the river being but little swollen here. Indeed it is so noticeable that the rise and fall of the river depends very little on the fall of rain in this neighbourhood, that the people here have invented a theory that it is caused by the wind blowing on Summerwater, a small lake in Wensleydale. The real reason, I suppose, is that the rains in the level country, and on the moors among which the Ure rises, do not occur always at the same time. A warm southerly wind meets the cold hill tops, and causes a very heavy fall, while here where there is no such condenser but little rain falls. This was the case remarkably in September, 1865, when a very warm moist wind arose on the 9th, and a fall of 6 in. at Seathwaite, and 2 in. at Arncliffe took place, while here the fall was only 0·07, which fell in a gradual drizzle. On the other hand, when a *north wind* furnished the condenser, more rain was extracted out of the warm air of the level parts than from the colder air of the mountains. The result may be tabulated:—

	S. wind.	*N.E. wind.*
Hills (Arncliffe)	2 in.	1 in.
Level Country (Ripon)	0·07 in.	2 in.

I may mention that during the last four months 17·33 in. have fallen here, the fall exceeding 4 in. each month, which is more than I ever knew before—the fall in 1860 having been only 16·7 for the corresponding period, June to September.

Ripon, October 13th. I am, Sir, &c., F. W. STOW.

* Seathwaite, 0·44 in.—*Ed.*

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RAINFALL IN OCTOBER, 1866.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground	Above Sea Level.	Depth of Rain. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which .01 or more fell.
			ft. in.	feet.	inches.	inches.	inches.		
I.	ENGLAND.	Camden Town	0 6	100	2·32	— ·28	·89	18	14
II.		Staplehurst (Linton Park)	0 6	296	1·38	—1·72	·34	18	11
,,		Selborne (The Wakes)	4 0	500 ?	1·66	—2·55	·47	24	10
III.		Hitchen	2 0	240	1·54	—1·01	·52	19	11
,,		Banbury	7 0	345	2·06	— ·37	·56	22	11
,,		Wisbech	0 6	10	1·37	...	·30	22	11
IV.		Bury St. Edmunds (Culford)	1 2	...	·54	—2·18	·10	18 & 27	8
V.		Calne	0 11	250	2·07	...	·64	21	11
,,		Plymouth (Goodamoor)	0 2	580	2·85	—3·32	·64	14	9
,,		Barnstaple	0 6	31	2·13	—1·99	1·03	25	13
,,		Taunton (Fulland's School)	1 4	...	1·90	—1·64	·54	22	15
VI.		Shrewsbury (Highfield)	5 6	200	1·61	—1·27	·53	22	10
,,		Tenbury (Orleton)	0 9	200	2·66	— ·57	1·02	25	15
VII.		Leicester (Wigston)	0 6	220	2·40	— ·30	·85	23	10
,,		West Retford	0 6	50	...	...	...	...	...
,,		Derby	5 0	180	2·95	+ ·11	1·00	18	12
VIII.		Manchester	2 7	106	2·52	—1·29	·52	24	13
IX.		York	0 6	50	1·87	— ·65	·74	25	14
,,		Skipton (Arncliffe)	3 0	750	4·46	—2·20	1·30	29	11
X.		North Shields	1 0	124	1·58	—1·70	·61	22	14
,,		Borrowdale (Seathwaite)	1 0	422	9·62	—6·70	6·00	29	11
XI.	WALES.	Abercarn	1 3	450	3·74	...	1·07	24	11
,,		Haverfordwest	2 0	60	2·74	—2·45	·59	25	9
,,		Rhayader (Cefnfaes)	2 0	880	314	—2·46	·70	25	14
,,		Llanberis (R. Victoria Hotel)	1 0	370	3·88	...	1·22	23	10
XII.	SCOTLAND.	Dumfries	0 5	70	2·39	—2·53	·97	18	12
,,		Hawick (Silverbut Hall)	4 0	512	1·28	...	·42	29	15
XIV.		Ayr (Auchendrane House)	2 3	94	2·65	—2·30	·82	29	11
XV.		Otter House	0 6	130	...	...	...	...	...
XVI.		Leven (Nookton)	0 6	80	1·89	—1·86	·51	18	15
,,		Stirling (Deanston)	0 0	130	3·28	—1·63	·86	18	15
,,		Logierait	1 0	250	3·21	...	1·00	18	14
XVII.		Ballater	0 10	656	2·08	...	·64	29	14
,,		Aberdeen	4 8	115	2·65	...	·44	31	17
XVIII		Inverness (Culloden)	3 0	104	1·94	...	·64	31	11
,,		Fort William	0 8	20	6·85	...	1·82	29	18
,,		Portree	0 4	60	7·78	—3·00	2·26	31	15
,,		Loch Broom	0 8	48	3·19	...	·87	31	13
XIX.		Helmsdale	1 0	34	2·01	...	·62	31	16
,,		Sandwick	2 0	78	2·76	—2·16	1·02	28	17
XX.	IRELAND.	Cork	6 0	65	3·21	...	1·04	17	16
,,		Waterford	4 0	60	2·60	—1·80	1·29	17	13
,,		Killaloe	5 0	128	2·44	—2·58	·56	26	14
XXI.		Portarlington	9 0	236	1·73	—3·40	·33	14	14
,,		Monkstown	0 6	100	2·74	—1·18	1·06	17	12
XXII.		Galway	6 0	25	2·60	...	·46	23 & 29	17
,,		Bunninadden (Doo Castle)	1 0	...	2·40	...	·67	17	15
XXIII		Bawnboy (Owendoon)	1 3	218 ?	3·49	..	1·10	17	14
,,		Waringstown	0 4	191	2·06	...	·62	17	10
,,		Strabane (Leckpatrick)	0 5	260	2·35	...	·53	17	15

+ Shows that the fall was above the average ; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail.

ENGLAND.

CAMDEN TOWN.—So dark from 9 to 10 a.m. on 16th as to require gas; dense fog on 27th.

LINTON PARK.—First 17 days fine, dry, and bright, contrasting strongly with September; the remainder changeable—winds, fogs, and hazy showers, alternating with now and then a fine day; no heavy rain, bar. very unsteady; frosts on 15th, 16th, 27th, and 29th, but not severe enough to do any harm. No high winds, nor any thunder; the nights very dark when there was no moon.

SELBORNE.—Winds very variable, but for the first half of the month the N.E. most prevalent; afterwards S.W. till 26th. Hoar frost on five nights; Fog on 27th; only ·04 of R prior to the 16th; fog from 1st to 9th inclusive. Max. temp. 65° on 3rd; min. 28° on 16th and 29th. Aurora on 10th.

BANBURY.—Max. 62°; min. 32°·5; only ·03 in. of R prior to 17th.

WISBECH.—Hoar frost on 15th and 16th. Lunar halo on 23rd. The month generally was calm, dull, and foggy; there was a strong wind on one day only (the 30th), and the bar. seldom below 30 in.

CULFORD.—Max. 68° on 2nd; min. 22° on 14th and 15th, the frost making sad havoc with such things as French beans, dahlias, &c.

GOODAMOOR.—Max. 68°, min. 30°; no R from 1st to 13th.

TAUNTON.—Heavy mist on 3rd; frost on 13th. Only ·07 in. of R prior to 14th.

SHREWSBURY.—Only ·01 in. prior to 15th.

ORLETON.—Only ·02 in. prior to 14th. Rainbow at 9 a.m. on the 11th. The first half of the month was dull, damp, and cloudy, with no R and scarce any sunlight. After the 17th a large amount of R fell, especially on the 24th, when the brooks were flooded more than they have been all the season, but there were a few bright days at intervals. Max. 63°·4 on 19th; min. 29°·5 on 16th. No T or L.

WIGSTON (Leicester).—The character of the month has been foggy, overcast, and cheerless, though there was only ·10 of R till the 19th.

ARNCLIFFE.—The early part of the month remarkably fine; scarce any R till the 17th. Max. 59° on 1st; min. 28° on 16th.

NORTH SHIELDS.—Fog on 1st, 2nd, and 3rd.

SEATHWAITE.—No rain on first 15 days. The month chiefly remarkable for the tremendous downfall of 6·00, on the 29th; this fall has only been exceeded on three occasions during the 22 years the gauge has been in use. The fall at the Stye for the month is 15·21 in.; computing the fall on the 30th by comparing this with the total at Seathwaite, we have for the Stye gauge the enormous quantity of 9·48 in., the whole of which fell between 4 p.m. on 29th and 9 a.m. on 30th. So high a flood has not occurred in living memory.

WALES.

ABERCARN.—The month has been rather fine, the temp. being about that of September, and nearly all the rain falling between the 17th and 24th; wind easterly for the first fortnight.

HAVERFORDWEST.—First fortnight cloudy, calm and mild; afterwards a period of broken weather, wet and very stormy, particularly the 28th and 29th, when it blew a heavy gale; slight frost towards the end, but on the whole a fine month, the rain falling principally at night.

CEFNFAES.—Max. 63°; min. 24°. A mild and damp month; leaves falling so early that their autumnal beauties could scarcely be enjoyed.

SCOTLAND.

DUMFRIES.—The weather dry for the first twelve days, and favourable for the close of harvest, though sometimes hazy; on the 15th, 16th, and 17th, sharp frost nipped dahlias and other flowers; the 18th a very wet and stormy day. The latter half of the month showery, but on the whole not unseasonable. The night temp. nearly 5° above last October, and the average for the month 2°·7 higher. The potatoe crop in some places little or no disease, in others a fourth to half; on the whole the proportion of sound tubers considerably above the average crop.

SILVERBUT HALL, HAWICK.—Farmers busy from the 7th to 20th leading their

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corn. Green peas gathered daily. Fishers all very busy on 30th. Dahlias, verbenas, geraniums, and many tender annuals, are still blooming beautifully, and might make a coronet fit to adorn the brow of Autumn.

AUCHENDRANE.—Max. 66° on 1st and 17th; min. 27° on 26th. Frost on 7 nights; the winds have been chiefly from the south and moderate, with frequent calms, and a large amount of cloud. Driest October since 1856.

NOOKTON.—Weather calm and mild for the season.

DRANSTON.—Max. 62°·5 on 19th; min. 23°·5 on 26th. Very high wind on 29th. Grain crops got in by the middle of the month, but in bad condition. Though not much R fell in the early part of the month, yet there was little or no wind, and the air was dull, and damp with heavy dews and haze. Some disease of potatoes is noticed, but not to a great extent. No thunder.

LOGIERAIT.—A fine month; strong sunshine from 5th to 10th; frost on the morning of 25th.

BALLATER.—Lunar halo on 21st. The first few days were remarkable for a continuance of dense fogs, with easterly airs or calms, with a very high bar. Max. temp. 67°·5 on 6th; min. 23° on night of 25th. Aurora on 7th.

ABERDEEN.—The month has been much more damp, warm, and quiet than the average, and a most unseasonable one for the harvest, a considerable portion of the crops being still out. Bar. above the average. Aurora on 7th, 9th, and 13th.

CULLODEN.—Only ·27 in. of R prior to the 27th. Fogs in the early part of the month. Hail on 28th.

ROSSE PARSONAGE, FORT WILLIAM.—Aurora on 3rd. The early part of the month was unusually fine and warm. On the night of the 13th a good deal of snow fell on the hills, and Ben Nevis was covered more than half way down. The latter part of the month was very wet, a greater amount being registered by me on the 29th than on any day in the two years during which observations have been taken here.

PORTREE, ISLE OF SKYE.—As I anticipated, October has proved a fine harvest month—the weather being fine till the 19th, the crops were secured in fine condition; after that date, wet and stormy, the 31st being the wettest day of the season, it having rained 13 hours without intermission. Scarlatina is still on the increase, and many deaths have occurred therefrom.

LOCHBROOM.—From the 1st to the 12th fine, dry, harvest weather; thence to 16th very changeable—cold, damp, and snowy on the heights; frosty at night till the 21st; fine, dry, and windy to the 26th; changeable, with snow and sleet, thence to the end, every sort of bad weather, high winds prevailing, especially on the 28th to 29th from the N.; the last day a constant downpour for 24 hours, though not heavy. The month, on the whole, till the 26th, favorable for the farmer and grazier, enabling the former to gather in the remainder of his crops, to give air and sunshine to that which had been harvested under less favorable weather, and to lift his potatoes in a capital state; it also enabled the grazier to prepare his flocks and herds for the winter.

SANDWICK.—October has been a fine harvest month, drier and milder than usual—indeed, the driest October on record, except 1856, and it was as dry as that till the 27th, 0·80 in. only having previously fallen; 1·96 fell on the last 5 days; the temp. was 1°·4 above the mean of the previous 39 years. Aurora on 5 nights; lunar halo at midnight on 22nd; gale on 17th from 6 a.m. all day, averaging 40 miles an hour. Bright meteor, shooting N., 6.30 p.m. on 5th; T & L on 29th.

IRELAND.

KILLALOE.—The smallest rainfall in October for 20 years, except three, viz :—1850=2·07; 1856=1·89; 1859=2·15.

MONKSTOWN.—The first 12 days very heavy, damp, and foggy, the 3rd, 7th, and 9th particularly so; no rain fell during that time. The absence of ozone during the first 16 days was very remarkable. On the 17th rain set in, and from thence to the 26th (on which there was a heavy gale), 2·25 in. fell. On the nights of the 24th and 25th, the ther. fell to 27° and 26° respectively. On the 24th, at 5.15 p.m., while still daylight, a bright meteor was seen, first a pale yellow, then changing to blue, it passed slowly from S.E. to E.; it was considerably brighter than Jupiter.

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Doo Castle.—No rain till the 12th; generally speaking the first half of the month was calm, dull, and foggy—the remainder wet. Frosts on the 9th, 13th, 16th, 25th, and 26th. The months of September and October of 1866, as compared with those of 1865, have reversed themselves in the quantity of rain fallen.

Owendoon.—The very seasonable weather of the first 16 days of this month have been of the greatest service to the country, and enabled the harvest to be at length secured. A *very* heavy fall of rain at 7 p.m. on 21st.

Waringstown.—Fine and seasonable; sharp frosts on the nights of the 15th and 24th.

Leckpatrick.—Winds easterly to the 11th, S.E. to 22nd, then shifted to south. Very dry beginning of the month; only on one occasion during the year were there so many days without rain—Oct. 1st to 12th, and July 14th to 26th. Frost on grass on six nights.

Rainfall on October 29th.—Mr. Fletcher's remarks on the Seathwaite return may be supplemented by a few words on the weather at other stations on that day, and on the narrow strip within which alone the fall was unusual—a strip extending along the west coast from Wales to the Hebrides, but only in places even of this strip did the fall assume unusual intensity. Mr. Crosthwaite was in Borrowdale, and reports the floods such as to render the roads impassable for some hours; yet at Keswick he only had 2·07 in., and at Grasmere and Llanberis the fall is returned as under an inch. At Fort William and in the Isle of Mull nearly 2 inches fell. The weather was at *Abercarn* squally from S.; *Haverfordwest*, heavy gale; *Hawick*, strong winds; *Ballater*, red sunrise, then clear, blew hard afterwards; *Culloden*, wet and stormy in evening; *Portree*, heavy westerly gale from 1 to 8, a.m., with hail; *Lochbroom*, gale from N.; *Orkney*, thunderstorm.

LATEST INTELLIGENCE.

The Predicted Meteor Shower.—The accounts which are coming in abundance from all parts of the country bear uniform testimony to the magnificence of the display; and we find that the time of maximum indicated by the following letter differs only two minutes from that given by Mr. Hind, at Twickenham:—

TO THE EDITOR OF THE TIMES.

Sir,—Perhaps you may deem the subjoined statement of the number of meteors noted by me last night worth a corner in *The Times*.

Your obedient servant,

136, Camden-road, N.W., Nov. 14. G. J. SYMONS.

METEORS COUNTED IN PERIODS OF FIVE MINUTES EACH, THE EYES BEING DIRECTED CONSTANTLY TO LEO.

	Time of Watching. h. m.		h. m.		No. of Meteors.
Nov. 13	11.45 p.m.	to	11.50 p.m.		17
Nov. 14	0. 0 a.m.	to	0. 5 a.m.		21
	0.15	,, ,,	0.20	,,	41
	0.30	,, ,,	0.35	,,	83
	0.45	,, ,,	0.50	,,	87
	1. 0	,, ,,	1. 5	,,	264
	1.15	,, ,,	1.20	,,	276
	1.30	,, ,,	1.35	,,	141
	1.45	,, ,,	1.50	,,	60
	2. 0	,, ,,	2. 5	,,	48
	2.15	,, ,,	2.20	,,	25
Nov. 14	2.30 a.m.	to	2.35 a.m.		25
	2.45	,, ,,	2.50	,,	20
	3. 0	,, ,,	3. 5	,,	26
	3.15	,, ,,	3.20	,,	20
	3.30	,, ,,	3.35	,,	16
	3.45	,, ,,	3.50	,,	12
	4. 0	,, ,,	4. 5	,,	16
	4.15	,, ,,	4.20	,,	12
	4.30	,, ,,	4.35	,,	8
	4.45	,, ,,	4.50	,,	4

Remarks.—Meteors most numerous at 1.12 a.m., when they were falling at the rate of 100 per minute—in fact, the sky was scored in all directions with their trains; the largest was not twice the apparent brilliancy of Sirius; the trains were, in some instances, visible in a 2½-in. telescope for two minutes. From 2 to 3 a.m. the meteors were not so large as before and after that hour, nor did they appear so uniform in direction,—two passed in parallel lines, but opposite directions. No lightning was seen unless it was at 0h. 35m., when two flashes of light were seen, but they were supposed to be from meteors in the north. I estimate the total number visible at about 7,000 or 8,000.—G. J. S,

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

XI.] DECEMBER, 1866. [PRICE FOURPENCE, or 5s. per ann. post free

THE METEOR SHOWER OF NOVEMBER 13TH-14TH.

Properly to describe the beauteous display of the memorable November night is no easy task, and one we would gladly avoid, but many missed the sight, and for their sakes and also perchance for future reference, we make the attempt. The air was clear, crisp, and bright, as if borrowed from December or January—in fact, as free as possible from all the ordinary attributes of November weather. Traces of cloud on the northern horizon, but otherwise cloudless; in the N.E. there was a faint glow of light (auroral like), until about 2 a.m.; temperature 41°; the ground as firm as if frozen; these the atmospheric conditions. Watch was kept at Camden Town, at intervals from 9 p.m., but no meteors were seen until 11.13 p.m. At 11.45 p.m. regular counting was commenced with the results mentioned on p. 90, and shown in the accompanying diagram. The total number counted between 11.45 p.m. and 4.50 a.m. was 1222, but as they were only counted during 5 minutes out of each quarter hour, the number must be tripled to reach the number which continuous counting would have given—viz., 3666; addition must also be made for those hidden by cloud (from 12.30 to 1 a.m.), and for those which escaped counting at the time of maximum frequency (1.10 a.m.)—perhaps 5 per cent.—we then get nearly 4000 for the portion of the sky watched, and we shall probably be considerably under the truth if we put the total number visible at 8000—more than half of them appearing between 1 and 1.45 a.m., while at 1.12 a.m. they averaged quite 100 per minute. At this time, the constellation Leo, whence almost all the meteors radiated, was well out of the mist in the horizon, and was dotted with balls of light with tails so foreshortened that they seemed but elongations of the head, while around, as from a fiery crown, meteors mostly more brilliant than Sirius (which was shining in the west) darted north, south, and west—their bodies mostly white as the ball of lime in an oxy-hydrogen lamp, their tails always brightest in the middle of the track and generally invisible close to the head. Several remained visible long enough for the telescope to be turned to them, and careful remarks made on their apparent structure; usually they were much wider in the middle than elsewhere, and on two occasions were observed to bend before they faded from sight; it looked as if they were heavier in the centre, or as if a gust of wind had swept across their track. Most of the trains were tinged with green, but purple and other tints were by no means absent, the resultant beauty when (as was often the case) two or three differently tinged trains were visible in close proximity was extreme.

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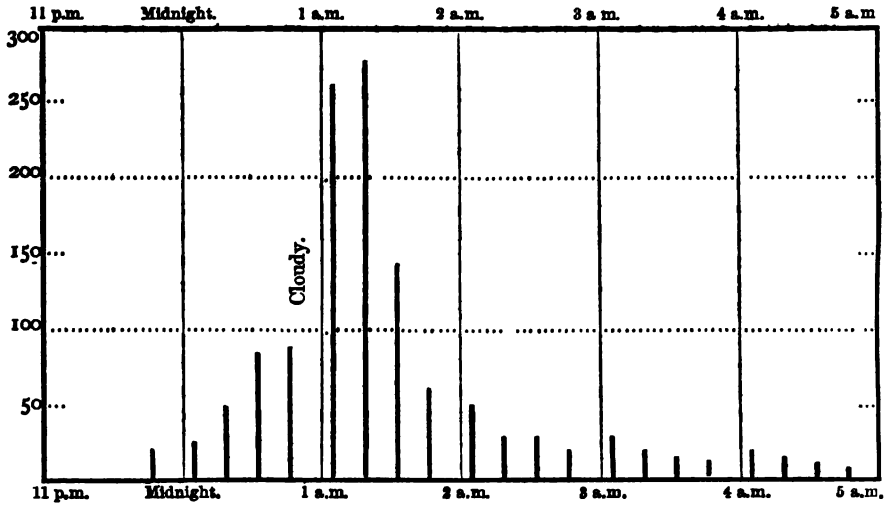
Number of Meteors counted in periods of 5 minutes each, the watch being kept constantly towards Leo.



NOTES ON THE METEOR SHOWER.

ENGLAND.

TWICKENHAM (*J. R. Hind, Esq.*)—Number of meteors, from midnight to 1 a.m., 1120; 1 a.m. to 1 h. 7 m. 5 sec. 514 were counted, and many more visible; at the latter moment there was a sudden increase, which rendered enumeration impossible; after 1.20 a decline became perceptible; from 1.52 to 2.9, 300 were registered; from 3.9 to 3.24, 100; from 4.42 to 5, 12; and from 5.45 to 6, only 5. Maximum frequency at 1.10 a.m.

PRIMROSE HILL (*Mr. Crumplen*).—Large meteors very abundant shortly after 10, the number rapidly increasing for the next three hours; between 0.25 and 0.35 421 were counted (two observers), afterwards many more; from 2.7 to 2.17 only 149. Some trails visible 10 minutes after the head had disappeared; they were mostly of a brilliant pea green colour. Eight of them were observed through a Dollond's telescope 1½ inch aperture, power 30; they were then found to exhibit tremulous motion, and in a few instances, curled themselves up and apparently began to descend. Radiant, R.A. 147°; N.P.D. 66°.

LONDON.—About 1.15 a meteor, starting nearly from the horizontal line of stars in Orion, crossed the sky towards the west, and as generally the case with the other meteors, the nucleus first disappeared, after a momentary increase of brilliancy, leaving behind it a long line of train, the centre of which remained bright for some instants; I continued to look at it surprised that it remained so long visible. It appeared then as a streak about the length of two diameters of the sun gradually becoming fainter and more confused, so that I was almost thinking that there might be some nebula accidentally situate behind that part of the sky into which it had dissolved. Still I did not lose sight of it, but after two or three minutes I observed that this remnant of the meteor was slowly going lower in a line rather inclined to the west, but nearly coinciding with its meridian. At last it disappeared entirely, after having travelled during ten minutes a length of two or three diameters of the sun.

COVENTRY—(*W. W. Tyler, Esq.*)—From 10.30 to 12 counted 30 meteors; from 12 to 1, 250; just before I counted 800 in 15 minutes; after that it was impos-

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sible to count them, 8, 10, or 20 being visible at once; trails either blue or green; the head usually became extra brilliant at the moment of extinction. Sky clear, with occasional rain clouds.

PRESTON—(*Mr. T. Aspden*).—Occasional heavy hail showers and strong wind, but the meteors were well seen through gaps in the clouds; the grandest display was at 1.10 a.m.

PUTNEY—(*Dr. Phipson*).—First meteor seen at 9.20. Out of many thousand meteors, only 5 were noticed which did not accord with a radiant in Leo.

DOVER.—Began soon after 10 p.m.; most numerous about 1; decreased rapidly by 2, after which it was cloudy. Lightning in N. all night. Often several meteors visible at once, running in parallel lines of various colours.

LEICESTER.—Stormy night; lightning and rain. Meteors very numerous as seen through gaps in the clouds.

NOTTINGHAM.—Cloudy with rain till 12.30; sky then cleared, though thunder and lightning continued. Very brilliant display; like a luminous fountain.

LIVERPOOL.—Overcast with a furious storm, but the sight was well seen at intervals when the clouds broke.

SOUTHAMPTON.—The star shower lasted from 11.30 p.m. to 6 a.m.

WEYBRIDGE—(*B. Scott, Esq.*)—Four inexperienced counters noted between 11.15 and 11.25, 9; 11.25 to 11.30, 13; 11.30 to 11.37, 23; 11.37 to 12.0, 89; 12.0 to 12.30, 452; 12.30 to 12.45, 795; 12.45 to 12.47, 152; after this, it was impossible for us to count them. Between 1 and 2 a.m., the singular phenomenon was noticed of two meteors approaching each other so closely as to become involved in mutual attraction, and they passed out of sight revolving round each other (like partners hands across in a country dance) describing spirals of light. Our impression was that even during the fullest flow the stream of meteors did not run evenly, but fitfully, as it were in waves.

GLOUCESTER.—First seen about 11 p.m.; cloudy afterwards till about 1 a.m., whence till 2 the display was magnificent.

WEYMOUTH—(*G. Bishop, Esq.*)—Maximum at 1 a.m.

CLIFTON—(*Dr. Burder.*)—Overcast for 15 minutes between 12 and 1 a.m.; at other times thin haze, but generally cloudless throughout the night. No meteors till 11 p.m.; number increased rapidly about 1 a.m., and the maximum was reached at 1.5 a.m. Between 1.5 and 1.7 81 were counted in one half the sky; between 1.11 and 1.20 200 were counted, from 1.22 to 1.31 200, mostly about the apparent size of Sirius; the trains mostly of a delicate greenish hue and strikingly phosphorescent. Radiant on a line between gamma and mu Leonis, 3° from gamma and 5½° from mu.

MILLAND, LIPHOOK, HANTS—(*Rev. J. M. Heath*).—"At about half-past one o'clock this morning, my attention was attracted to a meteor brighter than the others which were showering over the sky, and which was passing nearly in a line from Castor and Pollux to the Pleiades. This meteor left a trail behind it, as did many others also; but this trail did not rapidly disappear, as most others did, but remained distinctly visible for an unusually long time. I estimate the time it lasted as about three or four minutes. During all this time I distinctly saw that it was revolving about an axis within itself. It had thus revolved through more than a right angle before I lost the power, from its faintness and the alteration of its shape, of saying what its direction was. When I first suspected that it was revolving, it pointed directly to the Pleiades; before that, therefore, it must have pointed to the west of them. I then distinctly watched it, and saw it move in the direction contrary to that of the hands of a clock until it was at right angles to its first position, and it remained visible for some time after that. During all this time the shape was undergoing alteration. What was at first a band of nearly uniform breadth, tapering only towards the extremities, gradually became thicker in the middle as it shortened itself, and had the shape of a section of a lens."

WROTTESLEY (*Mr. Hough*).—The colour of the trains was generally greenish blue.

WISBECH.—(*S. H. Miller, Esq.*)—Fine meteoric shower (observations interrupted at 1.10 a.m. on 14th by a storm, wind 5lbs. pressure); total counted, 1157.

CALNE.—(*Col. Ward.*)—Brilliant display of meteors on 14th; lightning in S.E.

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GOODAMOOR.—(*H. H. Treby, Esq.*)—The early part of the night (13th) was cloudy, with showers, but after midnight it cleared in time to see the predicted shower of meteors, a sight not new to me, having been so fortunate as to have seen the one of Nov. 1833, at about one o'clock in the morning of 13th, they were so numerous and fell so fast, that I could not pretend to count them; they seemed to prevail most in the north-east part of the heavens. Many persons doubted my story, thinking it an after-dinner vision, as it was on my return from a party at Newnham Park in this parish, on horseback, that I saw them; it was most wonderful and not to be forgotten by me.

PENZANCE (*The Times*).—Meteors most abundant about 1 a.m., when the wind was strong from the N. Very few fell towards the horizon. The succeeding night was cloudy till after 2 a.m.; after that hour it is reported to have cleared and "revealed the same effects as on the preceding night."

OXFORD OBSERVATORY (*Rev. R. Main*).—Maximum frequency at 1·24. In one particular instance the train of a meteor was visible for some minutes; this was the train of a bright meteor which disappeared in the belt of Orion, leaving the train apparently attached to Zeta Orionis, and giving to that star the appearance of a comet with a tail of nearly 3°, standing out at a position angle of nearly 135°. It then detached itself from the star, keeping up the same route as the meteor, but forming itself into a ball of faint cometic appearance of about 15′ diameter, which grew dimmer and more diffused, and disappeared altogether after a lapse of about 4m. to 5 m. at a distance of nearly 1° from Zeta Orionis, at a position angle of about 200°. This meteor appeared at the time of the greatest display, at 13h. 24m. Only in two instances meteors were seen to burst, one in the east and another in the north.

HULL (*W. Lawton, Esq.*)—Am informed several meteors were seen on the previous day (about 3 a.m. on 13th) through a gap in the clouds. About the time of maximum, 1.10 a.m., the number was between 100 and 200 per minute. The next night and morning (14th-15th) the sky was cloudless, but no meteors were seen.

GREENSIDE MINES, PATTERDALE.—(*Mr. J. Barningham.*)—On 13th November about 7 p.m. I was astonished with a glare of light as if by an explosion of gunpowder, sufficiently light to read by; on turning round my face to the S., I saw N.E. of the constellation the Great Bear, a long train of light about 4 yards long; but the most brilliant light only lasted 2 seconds. Many bystanders saw it with cries of astonishment.

WEYMOUTH (*Dr. Allnatt*).—Splendid display; slight crackling sound, perhaps due to the rippling of the tide.

ALDERSHOTT (*The Times*).—A letter from L.G.M., referring to the remark of Dr. Allnatt as to sound, states that it was distinctly heard by the writer and a friend.

WELLINGTON COLLEGE (*R. Granville*).—Heard the same sound as Dr. Allnatt, in the quadrangle of this college, at intervals between 1 and 2 a.m.

[The above are the only intimations of sounds having been heard, and singularly enough two are from the same neighbourhood, while the other is not positively affirmed. The contrary assertion of absolute silence is so frequent that a list of places would be wearisome.—ED.]

WALES.

CARDIFF (*Messrs. Thompson*).—At 1.8 a meteor three times the apparent size of Jupiter, shot from Castor through the Pleiades, purple nucleus, train some minutes broad, at first quite straight; a part about 15° long near Aldebaran remained visible after the ends had faded, and assumed a serpentine form, afterwards took the form of a small oval cloud and moved from Taurus towards Orion, being visible as a faint cloud until 1.20, or 12 minutes from its first appearance.

ABERCARN.—(*Rev. D. Charles.*)—The remarkable shower of meteors was observed here on the 13th. It commenced at midnight and continued until 3 a.m.; the maximum being about 1 a.m. (14th) when there appeared a real shower of fire. From a reckoning made at the time, it was calculated that 20,000 must have fallen within the circle of our horizon.

HAVERFORDWEST.—(*E. P. Phillips, Esq.*)—On the night of the 13th, a little after midnight, the sky clear, and gale from N.W., the splendid phenomenon of the

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meteors was well seen; they appeared to pass with amazing rapidity and in countless numbers from S.E. to N.W. in direct opposition to the gale. They were visible till 4.30 a.m.

SCOTLAND.

BALLATER, ABERDEEN (*J. W. Patterson, Esq.*)—Meteors first observed about 11 p.m., but "after midnight the sight was really wonderful, there being a constant succession of them all across the heavens (like the file-firing of a company of riflemen but without the noise)." About 2 a.m. the sky became overcast with heavy rain.

GLASGOW (*A. S. Herschell, Esq.*)—Number of meteors seen per minute by one observer, watching half the sky—at 12.15, 2; 12.45, 12; 1, 25; 1.10, 56; 1.20, 57; 1.24, 43; 1.30, 30; 1.35, 21; 1.45, 5; 2, 1. Meteors mostly white or orange, their streaks emerald green. "Large meteors appeared at 12.33, 12.41, 2.14, and 2.42, they left streaks which endured from 5 to 14 minutes; each of the eccentric streaks contracted itself into a knot of light, which drifted, cloud-like, 8 or 10 degrees before it vanished. The last presented an imposing ring of flame 3 or 4 degrees in width; it remained visible for 14 minutes, gradually expanding itself into a heart-shaped loop, until it enclosed the chief stars of Ursa Major in a wide fantastic wreath before it disappeared."

LOGIERAIT.—(*Rev. G. D. R. Munro.*)—The meteor phenomenon was witnessed in all its splendour between midnight and 2 a.m. (on 14th); at times the whole heavens seemed as if lighted up, countless meteors shot along the sky in all directions though generally the course was westward from Leo; at times they appeared as if in pairs, and after running in parallel lines would diverge. Many were seen to burst, giving forth exquisite shades of color; the sky was cloudless throughout. Though carefully listened for, no sounds were heard.

ABERDEEN.—(*Rev. A. Beverley.*)—Magnificent meteors seen by thousands.

IRELAND.

MONKSTOWN.—(*A. Pim, Esq.*)—The meteors were seen from here in great brilliancy on the night of the 13th; they commenced falling in small numbers about 10.45; by 11.15 the number was greatly increased, in 6 minutes, from 12.24 to 12.30, I counted from my window (facing the N.W. and from which I could see about two-fifths of the sky) about 375, or at the rate of 3,800 per hour if continued; the direction of all being from E. to W.; some were of great brilliancy with long trains; at 3.30 a.m. they appeared to have ceased.

FOREIGN.

SPAIN, SARAGOSSA (*J. C. Robinson*).—Sky cloudless; about midnight a very abundant shower; all left a well-defined trail of pale bluish sparks; the heads usually white, but sometimes vivid emerald green, or tinted with pink or crimson.

MEDITERRANEAN, MALTA (*The Times*).—A letter from W. W. gives the maximum display at 1.30 to 2 a.m.

MEDITERRANEAN, MALTA (*J. P. H. Boileau, Esq.*)—Number at the lowest computation, 200 per minute; but it was impossible to count them, it was like a shower of hail. Fifteen sentries were interrogated with a view to determine the duration; the result being—commencement 1 a.m., maximum 2.30, over about 5 a.m. Only one seen on the following night.

ITALY, ROME.—Father Secchi, Director of the Observatory, is stated to have gone up into the mountains to lessen the chance of his observations being prevented by cloud; but both there and at Rome the sky was uniformly overcast.

THE METEORIC SHOWER IN AMERICA.—The meteors observed in America were not so numerous as those seen in England. Arrangements had been made in several cities to ring the bells in order to arouse the people if the spectacle should be such as was expected; but it was not. Professor Loomis, of Yale College, makes the following report:—"On Monday night, November 12, a company of observers at this place counted 696 shooting stars in five hours and twenty minutes, which is about four times the average number visible for the same period throughout the year. On Tuesday night, November 13, another company counted 881 shooting stars in five hours, which is five times the average number. On Wednesday night the sky was overcast, so that no observations could be made. We conclude that the number of shooting stars visible about the 18th was very remarkable; never-

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theless, this display is not to be compared with that of the 13th of November, 1833, in which the number of meteors was variously estimated at from 10,000 to 30,000 per hour. The grand display, therefore, which it was supposed might possibly occur this year has not been witnessed in the United States. . . If we receive no accounts of an unusual display of meteors this week in any part of the world, we shall look with considerable confidence for such a display on the 14th of November, 1867."

INCOMPLETE RAIN GAUGE EXPERIMENTS.

The following paragraph with reference to some desultory experiments at Camden Road, appeared on the cover of last month's Magazine :—

"I may just mention that *at present* there appears to be a considerable increase in the amount collected by gauges whose funnels are of glass and pot—*i.e.*, unoxidisable surfaces, the excess being nearly 6 per cent. ; and that gauges thoroughly protected from evaporation *may* exceed unprotected ones by about the same amount. Therefore (so far as the present observations go), a thoroughly protected gauge, with a permanently smooth surface would, apparently, exceed an ordinary one by nearly 12 per cent.—an enormous difference, and one which needs close scrutiny."

So many inquiries have been made respecting these experiments that I am reluctantly induced to print the results hitherto obtained—reluctantly, because they must, for several reasons be accepted with considerable reservation, and subject to correction, perhaps even to reversal by the better conducted series which will commence from January, 1867, prior to which time these and some other gauges will be placed on the lawn of Frampfield Lodge, Sussex, under the care of my friend, the Rev. T. E. Crallen, who has most kindly undertaken to continue the observations. A few words as to the "shelf gauges" will conclude; they were always all measured with one glass, hence any slight error in it would be common to all, but it is not 20 grains (= 0·004 in.) wrong at any point. The funnels are not at present *perfectly* uniform, but their areas are not sufficiently different to account for the differing indications; they are as under :—

N.W. end of shelf,	diameter	5·000	inches,	therefore area	= 19·64 in.
Glass funnel gauge	,,	5·003	,,	,,	= 19·65 in.
Earthenware ,,	,,	4·987	,,	,,	= 19·58 in.
White Can ,,	,,	4·997	,,	,,	= 19·62 in.
Sand buried ,,	,,	5·000	,,	,,	= 19·64 in.
S.E. end of shelf	,,	5·003	,,	,,	= 19·65 in.

The effect of these variations, amounting only to $\frac{1}{300}$th of the total area, is practically nil. A more serious source of uncertainty is the fact (only recently noticed) that the rims are not all equal in slope, so that possibly the excess caught by the glass and pot funnelled gauges is due in whole or in part to insplashing from their flatter rims. As most clearly showing the results obtained, the observations are entered as differences from a standard in each series, as stated in the table.

Subject to full correction by future and better conducted observations, the results may be thus epitomized. (1) An 8 in. gauge catches 1 per cent. more than a 5 in. gauge, if both are under similar conditions, (2) a gauge measured monthly, if well protected against evaporation, records 4 per cent. more than it would if read daily, (3) a gauge with a glass funnel collects 7 per cent. more than one with a metal funnel, (4) a gauge with a funnel of white earthenware, collects 4 per cent. more than one with a metal funnel, (these results are open to question for the reason stated above), (5) a gauge painted white records rather more (2 per cent.) than one painted black, perhaps because it is less heated by the sun, because (6) a gauge buried in wet sand, and with other provisions against loss by evaporation, exceeds an unprotected one by 5 per cent., and if read monthly, probably exceeds an unprotected one read daily, by about 8 per cent. *All these results must, however, be considered liable to contradiction.*

Conscious that I have not given, have not been able to give, to these observations the care they merit, I have the satisfaction of having broken ground, and the far greater satisfaction of knowing that henceforth they and the questions arising from them, will be in the able hands of Mr. Crallen.

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Gauges on, or partly sunk in, the ground. Gauges on a shelf running N.W.,S.E.

Read daily at 9 a.m. & 9 p.m.			Read at 9 a.m. 1st of month			Read monthly at 9 a.m. on the 1st.				
1866	8 in. Glaisher's gauge. 6 in. above ground.	5 in. Casella can gauge, bottle, & india rubber collar. 6 in. above ground.	5 in. Casella can gauge, bottle, & india rubber collar. 6 in. above ground.	5 in. Casella can gauge, no bottle. 1 ft. above ground.	5 in. Negretti gauge. 1 ft. above ground.	Mean of two gauges, one at each end of the shelf. Black can gauges, no bottle inside.	Black can gauge, no bottle inside, but with a glass funnel instead of a metal one.	Black can gauge, no bottle inside, but with an earthenware funnel instead of a metal one.	White can gauge, no bottle inside.	Black can gauge, with bottle and india rubber collar; it is bedded in a large closed case of wet sand.
April..	1·76	+ ·02	+·09	—·05	+·08	1·68	+ ·15	+·08	—·01	+·03
May...	2·03	— ·02	+·02	—·11	·00	1·83	+ ·22	+·11	+·07	+·13
June...	3·98	+ ·02	+·08	+·01	—·04	3·65	+ ·30	+·13	+·11	+·13
July...	1·19	— ·03	+·04	—·09	—·01	·98	+ ·11	+·09	—·08	+·15
Aug...	2·76	— ·02	+·12	+·02	—·04	2·51	+ ·25	+·17	+·08	+·24
Sept...	3·88	— ·09	+·26	+·26	—·08	3·97	+ ·12	+·09	+·09	+·12
Oct. ...	2·32	— ·04	—·01	—·12	—·13	2·14	+ ·05	+·06	+·02	+·03
Nov...	1·73	— ·03	—·02	—·23	—·11	1·55	+ ·13	+·06	+·01	+·05
Sums	19·65	—0·19	+·58	—·31	—·33	18·31	+1·33	+·79	+·29	+·88

To the Editor of the Meteorological Magazine.

Barlaston, Stone, Staffordshire, Nov. 29th, 1866.

DEAR SIR,—On the cover of the Magazine for the current month, you say—"There appears to be a considerable increase in the amount collected by gauges whose funnels are of glass and pot—*i. e.*, unoxidisable surfaces, the excess being nearly 6 per cent.," &c.

It may be satisfactory to you to know that my two gauges, placed side by side, one with a funnel 13¼ inches in diameter, made of fine glazed earthenware; the other a metallic Casella's 5 in. gauge, tested by yourself, register practically the same amount, the difference being, *not 6 per cent.*, but scarcely *one-hundredth of an inch*, after the heaviest rainfall. I am, therefore, inclined to think that the experiments referred to were not conducted with precision, or that the two sets of gauges were not placed in the same situation. Indeed, I do not see how so great a difference could be accounted for by any difference in the material of the funnels.

I remain, yours truly, WILLIAM SCOTT.

MIGRATION OF SWALLOWS.

Shortwood House, Staines, 19th October, 1866.

DEAR SIR,—The swallows disappeared earlier than I ever remember—viz., on 30th September and 1st October, from this neighbourhood, but more were seen on Wednesday afternoon, the 3rd, when we had a higher temperature, and some were here as late as 13th inst. My observations on this head have led me to believe for some years that these birds keep travelling *southwards*, for a fortnight before they all leave, that those from the *southernmost* parts of the island go first, and that their place is supplied from the midland districts, which are in their turn supplied from the north, and so on till all are gone. This is only theory, yet I am led to believe it, although I once saw swallows flitting about the race-course at Leicester, on 7th November, but I fancy these must have been late hatched birds, which could not encounter the long flight of their parents; this was, I think, ten years since. Three years ago I saw a few martins near Runnymede, on 13th November.

I have not registered a drop of rain this month till yesterday morning, when there was $\frac{1}{18}$ of an inch, and this morning $\frac{1}{28}$=nearly half-an-inch, which fell in twenty hours.

I am, dear Sir, yours faithfully,

HENRY ST. JOHN JOYNER.

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RAINFALL IN NOVEMBER, 1866.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground ft.	in.	Above Sea Level. feet.	Depth of Rain. Total Fall. inches.	Difference from average 1860–5 inches.	Greatest Fall in 24 hours. Depth. inches.	Date.	Days on which .01 or more fell.
I.	ENGLAND.	Camden Town	0	6	100	1·73	— ·68	·37	10	14
II.		Staplehurst (Linton Park)	0	6	296	1·89	—1·30	·37	13	13
,,		Selborne (The Wakes)	4	0	500 ?	2·08	—1·46	·53	8	14
III.		Hitchen	2	0	240	1·68	— ·46	·42	13	12
,,		Banbury	7	0	345	1·71	— ·49	·43	10	14
,,		Wisbech	0	6	10	2·24	...	·46	10	12
IV.		Bury St. Edmunds (Culford)	1	2	...	2·66	+ ·27	·43	10	12
V.		Calne	0	11	250	2·31	...	·55	12	12
,,		Plymouth (Goodamoor)	0	2	580	4·14	—1·46	1·46	11	17
,,		Barnstaple	0	6	31	3·91	— ·23	·75	11	22
,,		Taunton (Fulland's School)	1	4	...	1·14	—1·96	·45	9	7 ?
VI.		Shrewsbury (Highfield)	5	6	200	2·25	+ ·27	·42	8	17
,,		Tenbury (Orleton)	0	9	200	1·66	— ·81	·45	11	18
VII.		Leicester (Wigston)	0	6	220	2·28	+ ·12	·40	11	13
,,		West Retford	0	6	50	...	...	...	...	...
,,		Derby	5	0	180	3·06	+1·43	·42	10	19
VIII.		Manchester	2	7	106	5·72	+2·96	1·24	15	18
IX.		York	0	6	50	2·39	+ ·41	·84	17	15
,,		Skipton (Arncliffe)	3	0	750	9·45	+3·00	2·16	15	19
X.		North Shields	1	0	124	2·23	— ·48	·58	15	13
,,		Borrowdale (Seathwaite)	1	0	422	23·08	+6·41	6·38	16	22
XI.	WALES.	Abercarn	1	3	450	3·41	...	·87	10	10
,,		Haverfordwest	2	0	60	5·24	— ·43	·97	11	10
,,		Rhayader (Cefnfaes)	2	0	880	4·86	+ ·28	1·20	12	17
,,		Llanberis (R. Victoria Hotel)	1	0	370	8·70	...	1·87	15	20
XII.	SCOTLAND.	Dumfries	0	5	70	4·07	+ ·85	·87	15	21
,,		Hawick (Silverbut Hall)	4	0	512	3·38	...	·74	1	17
XIV.		Ayr (Auchendrane House)	2	3	94	6·17	+2·10	1·09	15	23
XV.		Otter House	0	6	130	...	...	..	...	...
XVI.		Leven (Nookton)	0	6	80	2·12	— ·92	·50	15	10
,,		Stirling (Deanston)	0	0	130	3·35	— ·16	·50	15	17
,,		Logierait	1	0	250	2·76	...	·53	11	16
XVII.		Ballater	0	10	656	1·96	...	·59	15	18
,,		Aberdeen	4	8	115	2·16	...	·42	10	19
XVIII		Inverness (Culloden)	3	0	104	2.64	...	·83	16	8
,,		Fort William	0	8	20	8·40	...	1·45	7	25
,,		Portree	0	4	60	8·10	—2·38	·80	4	27
,,		Loch Broom	0	8	48	9·25	...	·80	13 & 15	28
XIX.		Helmsdale	1	0	34	4·97	...	·69	7	24
,,		Sandwick	2	0	78	8·24	+4·24	1·05	12	26
XX.	IRELAND.	Cork	6	0	65	4·14	...	1·61	30	19
,,		Waterford	4	0	60	2·34	—1·61	·72	10	18
,,		Killaloe	5	0	128	4·77	— ·12	1·00	30	19
XXI.		Portarlington	1	2	236	1·89	—2·03	·40	11	19
,,		Monkstown	0	6	100	1·33	—1·56	·30	10	20
XXII.		Galway	6	0	25	4·02	...	·82	30	22
,,		Bunninadden (Doo Castle)	1	0	...	4·25	...	·64	15	26
XXIII		Bawnboy (Owendoon)	1	3	218 ?	5·46	...	1·36	15	24
,,		Waringstown	0	4	191	2·85	...	·86	15	23
,,		Strabane (Leckpatrick)	0	5	260	5·97	...	1·17	15	27

+ Shows that the fall was above the average; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.*

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail.

ENGLAND.

CAMDEN TOWN.—Thick fog on morning of 10th; heavy R from 9.5 to 9.12 a.m.; ·18 in 7 minutes. Lunar halo at 9 p.m., on 17th.

LINTON PARK.—A fine month, the beginning and end particularly so; L on the 2nd, 4th, and 5th; no high winds. Fogs few, and never intense; 12 frosty days, the sharpest being the 21st. Wind mostly W., N.W., and S.W. Bar. very unsteady about 16th and 17th; more settled towards the end. Evenings, when no moon, very dark, but as a whole the past month has been one of the finest on record for November.

SELBORNE.—Remarkable variations of both bar. and ther. from 16th to 21st; bar. on 16th, 28·85; 17th, 29·80; 18th, 29·27; max. ther. on 16th, 50°: 17th, 33°; 18th, 48°; 19th, 33°; and 20th, 32°; max. of month, 55° on 2nd; min. 23° on 20th; aurora on 8th.

BANBURY.—L on the 3rd. Max. 57°·5; min. 27°. Bar. rose more than one inch from 3 p.m. 16th to 9 a.m. on 17th. Fog on 28th.

WISBECH.—The first fortnight dull, the last week fine. White frost on 10th; lunar halo on 17th. Min. 28°·1 on 21st. Fine meteoric shower on 13th; total counted 1157; observations interrupted at 1·10 a.m. on 14th by a storm with L; pressure of wind, 51lbs. T on 24th.

CULFORD.—Max. 58° on 2nd; min. 23° on 9th. Month as a whole favourable for November. Meteors seen on 13th and 14th.

CALNE.—Violent wind and rain in the night of 10th, hard frost, dahlias, &c., killed. Max. 59°·5 on 3rd; min. 23° on 21st. Brilliant display of meteors on 13th, L in S.E.

GOODAMOOR.—A very wet and stormy night on 10th, after white frosts on 9th and 10th. Showery till midnight on 13th, when it cleared and meteors were seen.

TAUNTON.—Max. (in sun) on 2nd, 80°·5; min. on 21st, 29°·5.

ORLETON.—Warm damp month. Snow on 19th and 20th.

WIGSTON.—Weather fine and open, wheat sowing has progressed more auspiciously than could have been expected considering the wetness of the autumn.

DERBY.—An unusual flood (higher than has been known for 25 years) occurred on the 17th, in the low-lying districts of this neighbourhood, and also a portion of the town; the flood mainly attributable to the heavy and continued rainfall north of Derby.

MANCHESTER.—On the 14th and 15th the Irwell rose 25 ft. above its usual level, flooding a great part of Lower Broughton and Salford, and doing much damage; the rainfall of the 5 days preceding and including the 16th exceeded the average for the whole month.

YORK.—The rainfall on the 15th and 16th amounted to 1·34 in. in 30 hours, the average for the whole month being under 2 in. The river Ouse here rose 15 ft. above its summer level, but at Selby, 15 miles lower down, below the confluence of the Wharfe, much damage was done, and the floods in the West Riding were most disastrous.

ARNCLIFFE.—The rainfall on the 15th and 16th was 4·76 in., the average for the month being only 6·45.

NORTH SHIELDS.—15th, 16th, and 17th, rainfall amounted to 1·12 in.; the whole month only 2·23 in., being nearly half-an-inch below the average.

SEATHWAITE.—On 8 days more than 1 in. of rain, one of those days, the 7th, having 2·88 in., and the 16th, the large amount of 6·38 in., approaching very closely to the max. fall in 24 hours, during the 22 years, and having only been exceeded three times. Cumberland has escaped without damage from the prevailing floods, though the fall at some places (the Stye, for instance, 32·65 in.) has been enormous.

WALES.

ABERDARON.—From 1st to 9th fine, mild, and calm; 10th to 16th rainy and stormy; 17th to the end cloudy and foggy, though but little R.

* Notices of the meteor shower are given on pages 92 to 95.

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HAVERFORDWEST.—First half of the month wet, damp, gloomy, and at times blowing heavily, particularly on the 12th and 13th. Only three frosty nights during the month; snow on the hills on the 17th and 20th.

RHAYADER.—Weather generally damp and mild, heavy clouds and mists prevailing.

LLANBERIS.—More than 1 in. of rain on three days.

SCOTLAND.

DUMFRIES.—The first half of the month wet and stormy; only one day without rain till the 18th; 19th to 21st frosty and fine; thence to 25th showery; fine to the close of the month. Snow on the hills, on 14th, 16th, 18th, and 25th. The sunrise on the mornings of the 26th and 27th, unusually magnificent.

SILVERBUT HALL, HAWICK.—Falling stars, and high winds, on 6th, 7th, & 8th. Showers of meteors on 13th. On the 15th, about 7, a brilliant white luminous arch was visible for half-an-hour in the northern hemisphere; it spanned nearly a third of the horizon, the stars very dim were seen through it, and although it resembled an arch of the Aurora Borealis, it presented none of its flitting uncertain characters. Rivers full on 15th, and overflowing next day, 1·03 in. of rain having fallen in those two days; gathered green peas on the 5th.

AUCHENDRANE.—The river in high flood during the whole month, but never beyond its banks; highest on the 16th. Max. 58° on 1st; min. 23° on 17th. 24 hours of nearly continuous rain on 14th and 15th. Bar. on 15th at 9 a.m. 29·90; at 9 a.m. 16th, 29·16; and at 9 p.m. on the same day, 29·73.

DRANSTON.—Max. 56° on 1st; min. 22° on 17th; very high winds, on the 5th and 8th; heavy snow on the hills on the 17th, some snow showers on the 19th. Meteoric showers on the night of 14th, very distinct; 2·90 in. of R fell between 1st and 18th.

LOGIERAIT.—A remarkably fine month, notwithstanding stormy days; we had the first and hitherto the only covering of snow this season on the 16th, and from that date to the 20th very keen frosts.

BALLATER.—Lunar rainbow on 23rd. Very little snow this month.

ABERDEEN.—Max. 55°·7 on 1st; min. 27° on 17th. Smart snow showers from 16th to 19th.

FORT WILLIAM.—T about noon on 5th, and strong S.W. gale on 7th and 8th. Much snow fell on the 19th, and the weather for several days was very cold.

PORTREE.—This month has been wet, stormy, and squally, throughout. Gales on the 7th, 8th, 11th, 29th, and 30th. Fog on 10th, 21st, and 28th. 3 in. of snow on evening of 16th; frost on 11 nights. Scarlatina subsiding.

LOCHBROOM.—Without exception the most stormy November remembered by the observer; not one dry day from the 26th of October to the 29th of November, with high winds and gales particularly from the N., but no damage either by sea or land in this locality.

SANDWICK.—The month has been unprecedentedly wet, the rainfall having exceeded that of *any month during the previous* 26 *years*. Gale on 5th from 1 to 6 p.m., 66 miles per hour, and on 8th 67 miles. A severe T S on 11th, when the L struck a house about 7 miles E. of this, splitting the gable, knocking out the windows, breaking the crockery, and throwing two persons who were sitting by the fire to the other side of the room, without hurting them, though it tore the sole from one of their shoes. There was a sprinkling of snow on the 16th, and a snow-storm on 18th and 19th, followed by a thaw on the 20th.

IRELAND.

MONKSTOWN.—The month commenced warm and showery, but grew very cold towards its close, some of its variations being very remarkable, especially between the 16th and 19th; on 16th, 9 a.m., the temp. was 58°; on 17th, 34°; 18th, 49°·5; and 20th, 36°. Max. 58°·8 on 1st; min. 29° on 9th. Snow stated to have been seen on the Wicklow Hills on the morning of the 17th. A terrific gale on the 30th.

OWENDOON.—The fall on the 15th 1·36 in., the greatest yet observed.

WARINGSTOWN.—Early part of month, wet and stormy; the latter part fine, mild, and genial for the season. Frost on grass on 14 nights. Wind W. and upwards of W. on 26 days.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

XII.] JANUARY, 1867. [PRICE FOURPENCE, or 5s. per ann. post free

COLD WINTERS.

THE frost with which 1867 commenced brings again into prominence the desirability of possessing facile means of ascertaining the relation of present temperatures to those of bygone years; to this end we have prepared the following tables. No doubt they contain *some* errors (for people will talk of so many "degrees of frost," and confuse freezing point with zero), but the general accordance of the returns is sufficient to show their probable correctness.

Table I. needs no comment; excepting a few additions, it is as given by Dr. Lindley in the "Transactions of the Horticultural Society," Second Series, vol ii.

TABLE I.—*Temperatures in January*, 1838.

MIDDLESEX...Chiswick	— 4·5	NORFOLK...Norwich	— 3·0
Hammersmith	— 2·0	DEVONSHIRE...Bicton	18·0
Somerset House	11·4	CORNWALL...Carclew	12·0
SURREY...Walton, nr. Claremont	—14·0	STAFFORDSHIRE...Rolleston Hall	5·0
Claremont	—12·0	WORCESTER...Pitmaston	12·0
KENT...Beckenham	—13·5	WARWICK...Birmingham	— 3·0
Greenwich	— 4·0	LANCASHIRE...Liverpool	9·0
Sevenoaks	— 3·0	YORKS...Doncaster	6·0
Redleaf	— 1·0	Wetherby	10·0
SUSSEX...Arundel	9·0	NORTHUMBERLAND...Belsay Castle	10·0
HAMPSHIRE...N. Stoneham	0·0	GLAMORGAN...Sketty Hall	15·0
Isle of Wight, Binstead	15·0	Singleton	15·0
BERKS...Wallingford	— 5·0	LANARK...Glasgow	— 1·0
BUCKS...Dropmore	6·0	DUBLIN...Dublin	20·0
CAMBRIDGE...Cambridge	3·0	Glasnevin	15·0

This frost was evidently most severe in the environs of London.

The next remarkable cold period was Christmas, 1860; of it we have collected, from a variety of sources, the following ample details:—

TABLE II.—*Temperatures in December*, 1860.

MIDDLESEX...Chiswick	— 1·0	KENT...Dartford	1·0
Hammersmith	0·0	Sandhurst	7·0
Enfield	— 1·0	Lewisham	7·0
Hackney	5·6	Greenwich Observatory	8·0
Camden Town	6·7	Sevenoaks	15·0
Regent's Park	10·9	SUSSEX...Hurstpierpoint	3·0
St. John's Wood	11·0	Uckfield	6·6
Whitehall	12·7	Worthing	17·9
Guildhall	14·5	Fairlight	20·0
SURREY...Weybridge	4·5	HAMPSHIRE...Selborne	— 1·5
Cobham	6·0	Heckfield	2·0
Walton	11·0	Petersfield	7·5
Dorking	12·0	Aldershott	8·0
Battersea	10·5	Southampton	11·0

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HAMPSHIRE ..Isle of Wight, Ventnor	22·0
,, ,, Osborne	18·9
BERKSHIRE...Newbury	— 6·0
Welford	— 4·0
Moulsford	— 6·4
Englefield	— 2·0
Wallingford	0·0
Maidenhead	5·0
HERTFORD...Ball's Park	—10·0
Tyttenhanger	— 6·0
Cheshunt	— 5·0
Ware	— 5·0
Sawbridgworth	— 2·0
Harpenden	1·0
Hatfield	4·0
Berkhampstead	4·0
Royston	1·1
BUCKS...Taplow	2·0
Stowe	3·0
Westbury	7·0
Hartwell House	10·0
,, Rectory	7·0
OXFORD...Henley	— 2·0
,,	— 1·0
Rose Hill	1·0
Oxford Observatory	0·0
NORTHAMPTON ..Apethorpe	4·0
Oundle	4·9
Rockingham	6·0
Overstone	8·0
HUNTINGDON...St. Neots	—12·5
BEDFORD...Cardington	3·6
Aspley	13·5
Bedford	6·0
CAMBRIDGE...Chatteris	— 5·0
,,	— 5·0
Ely	— 5·0
Cambridge	— 5·0
,,	— 4·0
ESSEX...Saffron Walden	—12·0
,, ,,	—12·0
Epping	— 5·0
,,	4.0
Colchester	— 4·0
Apington Hall	— 3·0
Bardfield	— 2·0
Chelmsford	— 2·0
Leyton	1·3
Dunmow	4·0
SUFFOLK...Stowmarket	— 4·0
Bury St. Edmunds	— 5·0
Sudbury	— 4·0
Bungay	— 3·0
NORFOLK...Fakenham	—10·0
Long Stratton	—10·0
Diss	— 3·0
Holkham	0·0
Norwich	1·0
WILTS...Trowbridge	2·0
WILTSHIRE...Calne	2·0
DORSET...Upwey	11·5
Little Bridy	16·2
DEVON...Castle Hill	2·0
Dawlish	8·5
Torquay	22·0
Exeter	13·7
,, High-street	15·9
CORNWALL...Bodmin	14·0
Truro	11·0
Helston	18·0
SOMERSET...Langport	4·0
Bath	8·5
GLOUCESTER...Dymock	— 5·0
Highnam	— 4·5
Witcombe	2·0
Stroud	3·0
Clifton	7·1
Sedbury	14·0
HEREFORD...Ross	— 3·0
STAFFORD...Cheadle	—15·0
Rolleston	—10·0
Tamworth	— 7·0
Lichfield	— 6·0
WORCESTER...Eardiston	— 1·0
WARWICK...Atherstone	— 1·0
Birmingham	— 1·0
LEICESTER...Cole-Orton	3·0
Belvoir Castle	— 1·0
Brigg	—11·0
LINCOLN...Boston	0·8
Grimsby	— 6·0
Alford	3·0
Grantham	3·0
NOTTINGHAM.. Carlton	—12·0
Highfield House	— 6·0
Beeston	— 8·3
Beesthorpe	— 6·0
Worksop	— 6·0
Kingston Hall	— 5·0
DERBY...Chatsworth	—12·0
Willersley	— 6·0
Radbourne	— 3·0
Osmaston	4·0
Derby	2·0
CHESHIRE...Tarporley	— 8·0
LANCASHIRE...Old Hall, Sale	— 9·8
Thelwall	— 6·0
Wilmslow	— 3·0
Manchester	— 1·3
,, Old Trafford	— 3·0
Latchford	— 3·0
Eccles	— 3·0
Wigan	— 2·0
Holker	11·0
Liverpool	11·2
Stonyhurst	16·1
YORKSHIRE...Thorpe Perrow	—12·0
Bedale	—11·0
Doncaster	— 8·0

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YORKSHIRE...Wakefield	— 6·0
,, ...	— 4·5
Bradford	— 3·0
Kirkham Abbey.....	— 2·0
Coneysthorp	0·0
Grimston	0·0
Leeds	3·0
Castle Howard	4·0
Malton	8·0
,, ...	— 6·0
Whitby	10·0
Scarborough	16·0
Ben Rhydding	8·5
Sheffield	4·0
Otley	5·0
Harrogate	9 5
York	— 4·0
DURHAM...Sunderland.....	8·0
NORTHUMBERLAND...Alnwick...	—10·0
NOROHUMBERLAND...Alnwick...	12·0
Hesleyside	— 5·0
Hexham	2·0
Bywell.....	3·5
Allenheads	8·3
CUMBERLAND...Carlisle	9·0
,, ...	2·8
Silloth	1·5
Whitehaven	9·0
WESTMORELAND...Kendal	4·0

WALES.

GLAMORGAN ..Merthyrmaur ...	10·0
PEMBROKE...Pembroke	22·0
CARDIGAN...Lampeter	5·4
BRECKNOCK Crickhowell	— 3·0
RADNOR...New Radnor	— 3·0
FLINT...Hawarden	8·5
CARNARVON...Conway	18·0

From this it will be seen that the frost of 1860 was general throughout the country—temperatures below zero being recorded at 78 stations, and even —10 (10 below zero) being quite frequent, registered at 14 stations, and these in all parts of the country, except in the South and South-West.

Table III. is as yet very incomplete, but it seems quite sufficient to show how local has been the severity of the late frost; in fact, except in the Thames valley and at isolated stations, it does not appear to have been nearly so severe as in 1860.

TABLE III.—*Temperatures in January*, 1867.

MIDDLESEX...Staines	— 7·0
Winchmore Hill	— 4·0
Hammersmith	— 3·0
Camden Town	6·7
SURREY...Epsom	—12·0
Cobham Lodge	— 3·0
Cobham (Fyports)	— 6·8
Wimbledon.....	5·0
Walton	0·0
KENT...Maidstone	0·0
Greenwich Observatory.....	6·6
SUSSEX...Hastings.....	13·0
Framfield	6·5
HAMPSHIRE...Southampton.....	4·0
BERKSHIRE...Wantage	3·0
Maidenhead	— 3·0
Cookham.....	0·0
Old Windsor	4·0
Wallingford	— 5·0
Long Wittenham	6·0
East Hendred.....	12·0
HERTFORD...Berkhampstead ...	0·5
BUCKS...Datchet	— 8·0
OXFORD...Dorchester	— 2·0
SUFFOLK...Ipswich	11·0
NORFOLK...Cossey.....	4·5
DORSET...Bridport.....	11·0
DEVON...Exeter.....	9·0
SOMERSET...Street.....	3·5
GLOUCESTER...Boyce Court	7·0
Clifton.....	14·1
HEREFORD...Leominster	3·0
STAFFORD . Sugnall Hall.....	— 5·0
WORCESTER...Bromsgrove	2·3
WARWICK...Leamington	12·5
Birmingham	12·7
LEICESTER...Leicester	11·0
Wigston	9·0
NOTTINGHAM...Highfield Ho ...	10·2
LANCASHIRE...Liverpool Obs....	16·3
YORKSHIRE...York	10·0
Hull.....	8·0
Malton	6·0
Sheffield	15·5
Wakefield	5·0
NORTHUMBERLAND...Chathill...	24·0

Table IV. is intended to indicate approximately the lowest point to which a thermometer, 4 ft. from the ground, and fairly exposed in the suburbs of London, has fallen in each year since 1794. It is not so full and complete as we could wish, but we believe the possible

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occasional error of 2° or 3° is outweighed by the convenience of knowing approximately (1) that out of 73 years only two have had the temperature below zero—viz., 1796 and 1838; (2) that the temperature on December 25th, 1796, appears to have been the coldest ever recorded in London, it having been only 5° in the Strand, and about 6° below zero in the suburbs; (3) that the temperature may be expected to fall on one occasion in each year to 15°; (4) that the temperature in 11 years never fell to 20°, and (5) that in 1832 and 1863 its lowest was 25°.

TABLE IV.—*Lowest Temperature in each year from* 1794 *to* 1867. (LONDON AND ITS SUBURBS.)

YEAR.	Somerset House.	London. J. Haydn.	New Road.	Strand Cary.	Probable Minimum.	YEAR.	Somerset House.	Stratford. Howard.	Greenwich Belville.	Chiswick.	Probable Minimum.
1794	22·0			21·0	16°	1831	24·3	18·0	19·0	13·0	17°
5	7·0			7·0	1	2	27·8		21·0	22·0	22
6	4·0	-16·0?	—4·0	5·0	—6	3	27·3		20·5	22·0	21
7	24·5			26·0	18	4	29·2		23·4	24·0	23
8	11·0			11·0	5	5	21·0		17·2	16·2	16
9	17·0			17·0	11	6	17·5		12·6	13·1	12
1800	18·0			18·0	12	7	24·0	Greenwich Royal Obsy.	16·0	12·2	15
1	23·0			23·0	17	8	11·4		—4·0	—4·5	—4
2	15·0			14·0	9	9	23·7		20·5	17·0	18
3	19·0			19·0	13	1840	21·2		14·6	12·0	14
4	19·0	Stratford Howard.	Greenwich. Belville.	19·0	13	1	14·9	4·0	5·4	6·0	6
5	23·0			21·0	17	2	27·3	23·2	23·0	18·0	21
6	26·0			25·0	20	3		20·3	19·7	16·0	20
7	23·0	13·0	13·0	21·0	14	4		18·8	15·6	14·0	17
8	18·0	12·0	15·0	16·0	13	5		7·7	6·2	13·0	7
9	20·0	18·0	18·0	21·0	17	6		18·8	18·4	11·0	19
1810	14·0	10·0	13·0	18·0	10	7		10·2	11·0	19·0	11
1		14·0	14·0	21·0	14	8		15·8	16·6	17·0	16
2		18·0	17·0	23·0	17	9		18·8	18·3	16·0	19
3		19·0	19·0	22·0	19	1850		20·0		14·0	20
4		8·0	14·0	15·0	11	1		23·7		16·0	24
5		17·0	15·0	19·0	16	2		25·3		15·0	25
6		5·0	6·0	12·0	5	3		18·0		7·0	18
7		17·0	22·0	21·0	20	4		13·5		4·0	14
8		16·0	19·0	21·0	17	5	Camden Town.	11·1		0·0	11
9		10·0	13·0	16·0	12	6		19·4		11·0	19
1820	20·0	0·0	3·0	Chiswick Roy. Hort. Soc.	6	7		20·0			20
1	25·0	18·0	19·0		19	8	20·1	20·5			20
2	23·0	14·0	18·0		16	9	16·6	19·8			18
3	24·0	4·0	8·5		10	1860	6·7	8·0		—1·0	5
4	25·0	19·0	24·0		21	1	14·3	16·0		6·0	14
5	26·0	21·0	24·0		22	2	18·1	20·4		14·0	19
6	16·0	10·0	9·1	11·0	10	3	24·5	26·5			25
7	16·0	10·0	12·0	12·0	11	4	15·1	14·3			14
8	25·7	24·0	20·0	21·0	21	5	15·4	15·5			15
9	18·2	16·0	15·0	15·0	15	6	22·5	22·5			23
1830	15·8	8·0	10·5	10·0	10	7	6·7	6·6			5

In conclusion, we submit to the consideration of observers the desirability or otherwise of preparing a fuller table for the frost of January, 1867, and secondly, of preparing a table similar to Table IV.

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for other parts of the country. Scores of good registers exist, and we leave it to the observers to send or to withhold the needful data, viz.—(1) the lowest temperature in the air, 4 ft. above the ground, in January, 1867; (2) the lowest temperature in each year as far back as their records extend—not less than ten years. Of course there is no necessary connexion between these two requests—some may *only* have recent observations, others *only* old ones, but either would be useful.

RAIN GAUGE EXPERIMENTS.

To the Editor of the Meteorological Magazine.

December 18*th*, 1866.

SIR,—With reference to the question, now so much discussed in your pages, of the proper material for the funnels of rain gauges, I am disposed to think that the quantity of rain registered depends in a considerable degree upon the surface of the funnel, and whether that surface be or be not of a nature to allow of the speedy flowing off of the water. A *painted* metal funnel is bad, because when the paint is new the rain is apt to stand upon it in drops instead of running down through the pipe, and when old the surface is apt to become cracked and rough, and so retain the water upon it. Of all funnels I should suppose a *copper* one *unpainted*, and kept tolerably free from oxide (not too bright, or the water would in that case also be apt to adhere in drops,) would be best of all; but if porcelain should on trial be found preferable, I suppose that a white enamel (like that upon pans and saucepans) might easily be put upon a *turned iron* funnel, and would be of sufficiently uniform thickness to allow of the area of the funnel being calculated with sufficient accuracy.

As regards another point raised in your pages, I think that the reason why a gauge (properly protected from evaporation) shows a greater rainfall if read monthly than if read daily, is this: that every time the water is poured from out of the receiving-vessel into the graduated glass a certain quantity remains adhering to the sides of the vessel and is *not registered at all;* and that where the reading is taken *daily* this subtraction must occur *whenever any rain has fallen*, but where taken *monthly* can only occur *once in a month*. I have often doubted whether (where daily readings are taken) a greater approach to accuracy might not be obtained by reading from the *apparent* surface of the water in the measuring-glass, rather than from the "*true level*," as advised at p. 25 of your number for April last. I am, Sir, your obedient servant, H. W.

[We have for some years been wishing to try an enamelled funnel, but have always been told the heat necessary to the process of enamelling would fatally distort the funnel. We are not opticians, or we might be able to comprehend why a true brass rim could not be rivetted on *after* the heating.—ED.]

DERIVATION OF THE WORD "ANEROID."

To the Editor of the Meteorological Magazine.

Ryde, Isle of Wight, January 1*st*, 1867.

DEAR SIR,—At a philosophical lecture in the Isle of Wight a question was raised as to the derivation of the word "Aneroid," as applied to the barometer of that name. Can you or any of your readers throw any light as to its CORRECT ETYMOLOGY? I am, Sir, your obedient servant,

RICHARD TAYLOR.

[We were not aware that any other derivation had been proposed than *a without*, *νηρος moist*, and *ειδος form*. The "Encyclopædia Britannica," 8th Edition, gives, however, *ἀνέρομαι I inquire*.—ED.]

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RAINFALL IN DECEMBER, 1866.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground		Above Sea Level.	Depth of Rain. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which .01 or more fell.
			ft.	in.	feet.	inches.	inches.	inches.		
I.	ENGLAND.	Camden Town	0	6	100	2·63	+1·14	·53	5	16
II.		Staplehurst (Linton Park)	0	6	296	1·47	— ·36	·22	6	15
,,		Selborne (The Wakes)	4	0	500 ?	3·08	+ ·34	·62	5	15
III.		Hitchen	2	0	240	1·89	+ ·58	·38	6	19
,,		Banbury	7	0	345	1·88	+ ·21	·40	5	18
,,		Wisbech	0	6	10	2·05	...	·31	15	17
IV.		Bury St. Edmunds (Culford)	1	2	...	2·58	+1·09	·40	5	16
V.		Calne	0	11	250	2·86	...	·67	5	14
,,		Plymouth (Goodamoor)	0	2	580	6·67	+ ·74	·86	5	20
,,		Barnstaple	0	6	31	5·00	+1·88	·64	5	23
,,		Taunton (Fulland's School)	1	4	...	2·06	— ·46	·50	6	16
VI.		Shrewsbury (Highfield)	5	6	200	1·31	— ·37	·50	7	15
,,		Tenbury (Orleton)	0	9	200	1·74	— ·72	·41	4	21
VII.		Leicester (Wigston)	0	6	220	2·15	+ ·63	·39	30	18
,,		West Retford	0	6	50	...	...	...	...	...
,,		Derby	5	0	180	2·22	+ ·67	·41	6	22
VIII.		Manchester	2	7	106	4·15	+1·82	·58	3	24
IX.		York	0	6	50	1·75	— ·05	·54	6	18
,,		Skipton (Arncliffe)	3	0	750	10·05	+5·50	1·23	3	24
X.		North Shields	1	0	124	2·05	— ·15	·40	6	15
,,		Borrowdale (Seathwaite)	1	0	422	25·39	+8·44	3·66	10	25
XI.	WALES.	Abercarn	1	3	450	6·00	...	1·16	3	17
,,		Haverfordwest	2	0	60	4·68	+ ·15	·78	4	20
,,		Rhayader (Cefnfaes)	2	0	880	5·69	+2·40	1·28	3	25
,,		Llanberis (R. Victoria Hotel)	1	0	370	8·52	...	1·25	3	23
XII.	SCOTLAND.	Dumfries	0	5	70	3·40	— ·06	·48	6	22
,,		Hawick (Silverbut Hall)	4	0	512	3·46	...	·72	6	23
XIV.		Ayr (Auchendrane House)	2	3	94	6·32	+2·30	·69	15	21
XV.		Otter House	0	6	130	...	...	...	...	...
XVI.		Leven (Nookton)	0	6	80	2·94	+ ·16	·42	6	17
,,		Stirling (Deanston)	0	0	130	6·37	+2·17	·59	14	25
,,		Logierait	1	0	250	3·42	...	·75	7	18
XVII.		Ballater	0	10	656	2·87	...	·67	30	19
,,		Aberdeen	4	8	115	3·17	...	·71	28	25
XVIII		Inverness (Culloden)	3	0	104	3·36	...	·81	29	17
,,		Fort William	0	8	20	13·83	...	1·45	17	28
,,		Portree	0	4	60	15·44	— ·19	2·40	17	29
,,		Loch Broom	0	8	48	10·05	...	2·50	28	30
XIX.		Helmsdale	1	0	84	5·81	...	1·02	6	22
,,		Sandwick	2	0	78	4·76	+ ·80	·54	6	25
XX.	IRELAND.	Cork	6	0	65	4·22	...	·63	1	24
,,		Waterford	4	0	60	3·57	— ·85	·63	7	27
,,		Killaloe	5	0	128	6·02	+2·53	·82	3	26
XXI.		Portarlington	1	2	236	2·91	— ·28	·40	4	26
,,		Monkstown	0	6	100	1·71	— ·91	·52	6	21
XXII.		Galway	6	0	25	5·60	...	·68	6	25
,,		Bunninadden (Doo Castle)	1	0	...	4·60	...	·72	2	23
XXIII		Bawnboy (Owendoon)	1	3	218 ?	5·57	...	·76	6	25
,,		Waringstown	0	4	191	3·36	...	·48	3	23
,,		Strabane (Leckpatrick)	0	5	260	4·75	...	·44	2	26

+ Shows that the fall was above the average; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail.

ENGLAND.

LINTON PARK.—The whole month remarkably mild, the birds singing as if in March, while many tender plants injured by the frost in November became quite fresh towards the end of the month. Fogs prevailed during the beginning and middle of the month; with some few brisk winds but not at any time high, the prevailing direction being W.S. to S.W., there were ten slight frosts. L on 6th and 17th; evenings (when no moon) very dark.

SELBORNE.—Max. 51°·5 on 6th; Min. 21°·0 on 1st. Wind tempestuous during the month; almost entirely from the S.W., W., or N.W., except on 1st, 8th, 20th, and 24th. Not a flake of snow hitherto, this winter. 28th the most gorgeous sunset I ever beheld. Dense fog all day on 22nd.

HITCHEN.—30th December, bar. lower than at any time since March.

BANBURY.—31st, a little snow. Max. 55°·2; min. 27°. Fog on 22nd.

WISBECH.—26th, gale at 7 p.m., 14 lbs. pressure at 10 p.m.; 31st at 11 p.m., snow 1 in deep; wind S.W. on 20 days; slight frosts on 8 nights, but the month generally was mild. Dense fog all day on 22nd.

CULFORD.—Max. 56° on 6th; min. 17° on 31st. Severe and winterly weather appears to be setting in during the last night of the month and year. Fog on 22nd.

CALNE.—T S at 6 a.m. on 13th in W; violent T S at 8 p.m. on 14th, with H and wind; ·23 in. fell in 20 minutes, and another T S at 6 a.m. on 15th. Gale, with H storms on 7th; on 4th very mild, primroses in bloom, crocus above ground on 20th, and snowdrops on 28th.

GOODAMOOR.—T on 14th and 15th. Max. 53°; min. 24°.

TAUNTON.—L in E. on 12th and 15th; T S from S.W. and ranging northward to E. on 16th. Weather generally mild and even warm during the month; beans and strawberries in flower; slight fall of snow on 31st.

ORLETON.—Temp. variable, but on the whole higher than the average; the air generally damp, with frequent slight falls of R; violent winds on the 4th, 15th, 26th, and 27th; a slight fall of snow on the night of 31st; dense fog all day on the 22nd. Max. 58°·2 on 4th; min. 24°·3 on 20th.

WIGSTON.—Both the temp. and rainfall slightly above the average.

YORK.—Bar. 30·616 at 3 p.m. on 20th, and only 28·990 on 30th.

ARNCLIFFE.—Max. 56°; Min. 28°. A very wet month.

SEATHWAITE.—An excessively wet month, with but little frost till the last day of the year; four days on which the R fall exceeded 2 in.

WALES.

ABERCARN.—A wet and stormy month on the whole, but the latter part mild and calm. T S on night of 14th and another on 15th. There was no frost until the last day of the year, roses, wallflowers, &c., being still in bloom.

HAVERFORDWEST.—A stormy, gloomy, wet month. Very mild; primroses and garden cowslips in bloom, and on the 15th a rose carnation bloomed perfectly. Violent gales on the 6th, 13th to 15th, and again from 26th to the end. The last three days cold and gloomy, with snow. Ther. at or below 32° on 7 nights.

CEFNFAES.—High flood in the Wye on the 3rd. T and very vivid L on the 14th. Weather generally wet and damp through the whole month; only five really fine days. Max. 53°; Min. 19°. Snow on the 31st.

SCOTLAND.

DUMFRIES.—Snow on the hills on the 8th, and here on the 31st. The month has been wet and stormy, with a mild temperature. On the night of the 6th and morning of 7th a violent hurricane, and the bar. fell 1·245 in. in 24 hours. At Christmas the field daisy flowering abundantly, and the furze in blossom. The close of the month wintry, with snow and frost.

SILVERBUT HALL, HAWICK.—A hurricane from the W. on the 6th, and gales from the same quarter on 17th, 18th, 26th, 27th, and 28th. Gardening and husbandry operations in an advanced state, there having been no interruption from frost till the last two days of the month; but it is now pretty keen, and about 3 in. of snow on the level.

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AUCHENDRANE.—Month mild, wet and boisterous throughout.

DEANSTON.—No snow during the month, except on the hills. Max. 55°·8; Min. 21°.

LOGIERAIT.—Little frost till the 31st. Roses in bloom at that time. No snow.

BALLATER.—Aurora at 7 p.m. on 25th. The weather throughout (with slight exceptions) very mild. Max. 56°·3 on 18th, higher than for 2 months previously. Bats seen flying about from 22nd to 24th. Auriculas, primroses, &c., in flower. During the last week the weather became wintry, a snow storm commencing on the morning of the 30th, and the year closed with an average depth of 4 inches.

ABERDEEN.—A dull month, with very unsteady Bar., and less than the usual range of temperature. Frosts on 11 nights at 4 ft. from the ground, and on 24 on grass. Max. 53°·5 on 18th; Min. 24°·1 on 31st. Lunar rainbow on 21st.

ROSSE PARSONAGE.—Gale from N.E. through the night of the 6th; gale from S.W. on 18th; sprinkle of snow on 31st. A wet and boisterous month; only three days on which no R was registered. The total fall, 13·83 in., is greater than any month since observations were commenced here (two years ago), except January last, when 14·19 in. fell.

PORTREE.—This month has been very wet, stormy, and changeable throughout. A very bad month for sheep and cattle. Snow on the hills in the middle of the month, but none here till the close.

LOCHBROOM.—The month commenced beautifully, as if borrowing its character from the end of November, but on the 3rd a sweeping gale from the N. threatened great destruction; it was terrific during the whole day. With varying temperature, the month was rainy till the 28th, when we had a fall of 2·50, being more than double the greatest fall registered during the past two years. On the whole it has been a grand grazing month, but at the close intense cold and heavy snow came on suddenly.

SANDWICK.—Very bright Aurora from 7 to 8 p.m. on 25th. Hills white with snow on 7th and 8th, again on 27th. Gale 50 m. per hour from midnight to 5 a.m. on 28th. Ground white with snow on the 30th, and 4 inches deep at the close of the year.

IRELAND.

MONKSTOWN.—Although the total quantity of R was not great, the month was generally wet; the last day's measurement, ·15, consisted principally of snowy sleet, which fell in constant showers, ushering in the new year with quite a wintry appearance. Bar. on 6th, 29·124. One of the most fearful gales that has occurred for a long time was on the 6th and 7th; it commenced about 7 p.m. on 6th, and blew with terrific violence from S. until 11 p.m.; it then lulled, but only to recommence about 2 a.m. on 7th from W.S.W. with almost double fury. The sea outside was terrific, and the mail steamer was two or three hours late owing to the force of the gale.

GALWAY.—Terrific storm commenced about 8 p.m. on 6th, and lasted through the night. Min. 25° on 31st, with snow.

DOO CASTLE.—Wet open month, and as a rule free from frost. Violent storm on night of 6th; several trees snapped asunder, and stacks of corn blown down.

OWENDOON.—Very wet month, high floods; first snow on 31st.

WARINGSTOWN.—A wet and stormy month; the soil thoroughly saturated with moisture, but the temperature somewhat above the average until the last two days, which were cold and wintry. Heavy gales on the 6th and 28th. Snow on the 31st only. Frost on grass on 17 nights.

LECKPATRICK.—6th, gale.; Bar. 28·72 at 11 p.m., rose to 30·22 at 9 a.m. on 7th. Frost on grass 14 nights. Gale from S.W. 17th and 26th. Weather of month mild though stormy. Vegetation very far forward; fruit tree buds unfolding, hepatica in flower, peony rose coming into leaf.

NEWPORT, MONMOUTH.—With reference to the statement, page 52, No. VI., that "*square pieces of ice of upwards of a pound weight each were found in the neighbourhood of the Docks,*" I was informed, after the statement appeared in the local press, that it was a hoax. I was in the thick of the storm, and saw no hailstones apparently more than one inch in diameter. Great damage resulted from the deluge of rain. At a distance of four miles westward of Newport scarcely a drop fell.—W. FLINT.

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NOVEMBER METEOR SHOWER.

Observations of the Meteoric Shower, on the night of November the 13th, 1866.
Taken at the Military Hospital Observatory, at Aberdeen.

Estimated numbers, and direction of flight of Stars counted at Aberdeen, by Thomas Turner, in 4 hours, on the night of the 13th November, 1866.	N. to S.	N. to W.	N. to E.	N.E. to S.W.	N.W. to S.E.	S. to W.	S. to N.	S. to E.	E. to W.	E. to S.	W. to E.	N.E. to S.	E. to N.	Total No. of Stars counted per hour	Weather during night.	Direction of Wind.	Appearance during night.
From 10.30 p.m. to 11.30 p.m.	94	3	44	10		3	43		4	3	6	21		235	Clear but cloudy to S.E.	N.N.E.	The first star was seen fall at 10.30 p.m.
From 11.30 p.m. to 12.30 a.m.	123	53	41	56	53	131			25	6		29	3	421	Ditto.	Ditto.	Stars very brilliant from the N.
From 12.30 a.m. to 1.30 a.m.	339	28	143	86	6	3	8		34	1		6		704	Ditto.	N. W.	Stars brilliant, & an abundance from all quarters like rockets, but generally like fire balls.
From 1.30 a.m. to 2.30 a.m.	280	29	26	78	13	22			43			53		539	Over cast at 2.30 a.m.	W.	From 12.30 a.m. to 2 a.m. sky covered all over with stars darting in all directions.
Total No. counted	886	113	254	225	72	267	77	12	106	10	6	109	3	1889			

THOMAS TURNER, Sergeant A. H. Corps,
Hospital Sergeant 15th D Battalion, Aberdeen.

To the Editor of the Meteorological Magazine.

Rockville, Black Rock, near Dublin, December 18th, 1866.

Sir,—About 1 a.m. Nov. 14th (Dublin time) a brilliant meteor passed from the head of Leo about 10 degrees N.W. of the zenith, disappearing about 40 degrees from the western horizon. It left a brilliant tail behind, some 20 degrees long; this, after remaining stationary some 2 or 2½ minutes, gradually began to shorten and concentrate; then to curve, and in 2 or 2½ minutes more became circular by the two ends meeting together, in fact a perfect ring some 6 or 8 degrees in diameter, the centre being clear sky. The concentration still slowly continued, until in about 2½ or 3 minutes more the clear centre became obliterated, and the whole assumed the appearance of a brilliant, luminous, white globe about 4 or 5 degrees in diameter. In this state it remained some time, 2 or 3 minutes, and

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then gradually faded away. I cannot speak accurately as to time, but I think the whole may have occupied some 10 or 12 minutes. The thing was most wonderful—indeed astounding. I am, yours very truly,

THOS. BEWLEY.

P.S. Several persons in Dublin saw the same appearance I have described above.

An Essay on Dew and several Appearances connected with it. By WILLIAM CHARLES WELLS, [M.D., F.R.S.L. & E.] Edited, with Annotations, by L. P. CASELLA, F.R.A.S.; and an Appendix by R. STRACHAN, F.M.S. London: Longmans, cloth 8vo. 163 pages.

MR. CASELLA deserves the thanks of meteorologists for placing within their reach copies of Dr. Wells' scarce, celebrated, and interesting Essay on Dew, with an epitomized biography, a few foot-notes, pointing out the bearings of recent discoveries on Dr. Wells' researches; also an appendix by Mr. Strachan, which consists mainly of quotations from Tyndall's recent works on Heat and Radiation, Glaisher's paper on radiation ("Phil. Trans. 1847"), and other articles bearing on the subject. The notes and appendix have one main fault—there is not enough of either. To take an instance in the appendix: when speaking of summer frosts, no reference is made to the considerable ones experienced in July, 1863, and the beginning of August, 1864, when white frost was general throughout Great Britain, and even ice was formed in several places. This remarkable phenomenon having a special bearing on the influence of vapour on terrestrial radiation, which it is one of the main objects of the appendix to illustrate, for those frosts were unquestionably due to the excessive droughts which preceded their occurrence having rendered the atmosphere unusually dry, and therefore favorable to radiation. We differ from Mr. Casella, who says in the preface—"at the present day the Essay on Dew is the only one [of Dr. Wells' works] which can lay claim to the attention of the general reader;" and think a reprint or abstract of the elaborate review in the "Quarterly" by Dr. Young, and of Dr. Wells' reply published in the "Annals of Philosophy" in April, 1815, would have added to the completeness of the work. These, however, are small matters, pointed out mainly as suggestions, should the present generation require as many editions as when the essay was first brought out in 1814, followed by fresh editions in 1815, 1818, and 1821.

END OF VOL. I.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

XIII. FEBRUARY, 1867. [PRICE FOURPENCE, or 5s. per ann. post free

INTRODUCTORY.

IN the forefront of our first number we asked that it should not be taken as a specimen of succeeding numbers. We have the same reason for urging the same plea on the present occasion. We there also expressed the hope that we should be judged not by our promises but by our deeds, and we renew the request. We proposed, it is true, to give some articles which, after all, we did not give, and why not? Because matters of current interest crowded them out, in spite of occasional enlargements. Last month we announced our intention to give some rather elaborate details of low winter temperatures, yet this number appears without them. Why? Because we have received so large a collection of returns, of the most heterogeneous nature, that it has been impossible to prepare them as they deserve; they, therefore, must stand over till next month. Besides, the silver thaw of January 22nd claims special and early notice, and the Aneroid question requires settling at once.

A SILVER THAW.

THIS phenomenon is so rare in England—we only remember one previous instance (in 1855?)—that we make no apology for briefly describing it. On the 22nd of January, at 7.10 p.m., the ground being then frozen, and the temperature of the air below freezing point, some rather sleety hail began to fall on the pavement; it crackled under foot, and flattened out into diminutive lozenges; about 8 p.m. it turned to rain, although the temperature of the air was still several degrees below freezing point, and the ground was about 24°. The necessary result was the coating of everything with a layer of ice. At 9 p.m. the temperature at 4 ft. above the ground was 26°·2, and it was still raining, and the rain still freezing on pavement, walls, gravel walks, umbrellas, in fact on everything. We never recollect being (meteorologically) more mortified than we were at the failure of all our efforts to reach the thermometers 20 ft. above the ground; but climbing an iced pole was a feat beyond us, and we know not what was the temperature at that small elevation. It was especially vexing, because the opportunity once lost we shall probably have many years to wait for another. Of course the streets were in a frightful state. Cabmen refused fares of even £1 per mile, and the number of accidents

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was unprecedented. We do not know the limits of this phenomenon, but have heard of it from Surrey, Berks, Kent, Middlesex, Nottingham, and even Glasgow. Throughout this large tract of country there was for some hours (till 3 a.m. in London) no safe mode of traversing the roads or pavements but the very novel one of skating.

THE FROST OF JANUARY, 1867.

To the Editor of the Meteorological Magazine.

DEAR SIR,—In a recent letter to the "*Times*," you ask for notes on the frost of last week. Though not a scientific observer, I can give you some particulars which may be of interest, especially as the nucleus of the tract of cold air seems to have been in this neighbourhood.

There had been no indications (except, perhaps, the migration of birds) of any approaching cold, up to the 30th of December; on that day the weather was fine, with fresh W. wind, which shifted to N.W. in the evening, but as yet no frost. December 31st, sharp white frost; 25° at 9 a.m.; maximum of the day 32°. Driving to Hounslow, I observed large flocks of field-fares, but the red-wings which had been swarming westerly on Saturday, were not to be seen. Also the golden plovers (which had appeared in unusual numbers during the previous fortnight) had betaken themselves elsewhither. What little wind there was, came from the N., and the rime lay in patches, and both ground and air had a peculiar sulky appearance. Towards evening the sky cleared partially, the wind backed to W. and S.W., and at 11 p.m. of new year's eve, the thermometer stood at 24°, and barometer was low and steady.

January 1st, 1867, 24° at 9 a.m.; sharp frost all day; a sprinkle of snow on the ground; very little rime, and the frost turned to black, with brisk N.W. wind; clear in evening, 23° at 10 p.m.; a peculiar haze in the north, but clear sky at 11 p.m.

January 2nd, very deep snow, 8 inches on the average at 7 a.m., and coming down in clouds with a gusty N.E. wind. Temperature rising from 24° to 30°; snow ceased at noon, and was then a foot deep on the average, and drifted in places to 4 feet; all this had fallen in ten hours, having commenced at 2 a.m. Sky cleared, the sun came out, and the snow, as dry and as light as dust, rose in petty whirls, and flitted as if along the edge of a knife; the effect in the bright sunshine was very strange and beautiful. The temperature fell rapidly, and at 11 p.m., seven thermometers, on N. aspect, 6 feet from the ground, told very different tales, but all agreed that it was cold. They marked from 5° to 14°, 12° being probably the truth. My self-registering double column instrument works from 6° to 8° too low, and has another slight defect; the minimum needle follows the column, and therefore registers nothing.

January 3rd, minimum unknown, from the cause last mentioned, but a 3 feet 6 inches registerer (kept at my garden) marked +4 as the result of the night; the scale being iron, this mark would probably be too low; probably +8° was about the mark. I often wonder at the reliance of newspaper correspondents upon any unproven self-registerer; my impression is that scarcely any can be trusted in either extreme of temperature, though they work true enough for some part of the scale. In the forenoon a thick white haze arose, and the maximum was 28°; light E. wind, barometer slightly rising. Hazy at night; 20° at 11 p.m.

January 4th, 12° at 9 a.m.; minimum about 10°; sky grows brighter, and of a lovely violet colour; thermometer stationary all the forenoon at 12°; white haze round the horizon; trees and bushes clad with the deepest rime I ever saw, as if all the earth were "twelfth caked"; a scene of wonderful beauty. I walked to Kingston to see the Thames, and found it frozen here and there for a few yards from the bank, full of thin floating ice, and covered with a white rolling steam. The frost was so intense that the feet of my dogs became lumps of ice, which I was obliged from time to time to cut out with a pruning-knife. The maximum of the day was 18° in the shade, and 25° in the sun; the evening was very remarkable. If the sky would only continue clear, there was every prospect of the hardest frost

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ever registered. The temperature fell steadily up to 8 p.m., when a blanket of haze came over the sky, and fog upon the earth, and the radiation was checked. That was the acme of the frost; from that hour (although the intense cold could not quickly be shaken off) an increasing change began. At this remarkable moment my seven thermometers scored from—2 to+4; Negretti and Zambra's would have gone lower, but the needle stuck in the turn of the tube, and the spirit could no further go; the true minimum was, I believe, from zero to+2. On the famous Christmas Eve, 1860,+12° was the mark at 10 p.m., by some of the same instruments, at a distance of a mile hence.

The mercury was on the rise at 10, 11, and 12 p.m., and in the morning stood at 12°; then the signs of change grew more and more decided. The sun shone very faintly under a white corona, and muddy tails of cloud came out, and the sky was tiled with heavy blots. The maximum was 32°, with a S.E. breeze creeping up, and the night was dark and dirty. At 11 p.m. a storm of thick snow, with a temperature of 30°, and a blusterous S.E. gale; at 1 a.m. of the 6th the snow turned to sleet and rain, and it was all up with the frost.

I fear I have wearied you already, and will only add two observations. First, I have not given range of barometer, being under a disability. Mine strikes work at 29·50, probably because the bag is too small for the quicksilver; this is not as it ought to be. Secondly, I would state that the snow of January 2nd, was peculiarly light, and wanting in specific density. Six inches of the famous snow of January 11th, 1866, would, I think, outweigh a foot of our recent visitor. I forget what the proper formula is, but from 13 inches I only procured 1·15 of water.

In conclusion allow me to ask how any man who goes to bed can even approximate to the measure of fall on such a night as that of the 5th. The snow turned to rain, and of course was half gone or more in the morning, while the rain could not get into the receiver, the funnel being choked with snow? An answer in your next will oblige.—Your's faithfully,

Teddington, Jan. 9th, 1867. R. D. BLACKMORE.

[It is not so easy to answer as to ask this question. Clearly the capacity of the funnel was too small—as rain gauge funnels often are. On the other hand, if the capacity is great, small showers are unable to do more than wet the large surface, and thus *they* do not get registered.—ED.]

To the Editor of the Meteorological Magazine.

SIR,—Your tables of extreme cold at different places will, I am sure, have been read with the greatest interest by all. A table such as you propose, showing the lowest temperature registered at 4 feet in each year, at a number of different stations, will of course be interesting; but do you not think it might help on science more, if the conditions under which the extreme occurred were also given? Some necessary conditions it would be unnecessary to specify—*e.g.*, that the air was calm and the sky clear from clouds, and there must of course have been, and be, a very cold and undiluted "polar current" of air over the place. But there are other conditions which may, or may not, be necessary, and doubtless others again which are not yet discovered. That snow, by arresting the conduction of heat from the earth, and by spreading over all surfaces a good uniform surface for radiation, is very favourable to the production of great cold, is evident: and I have seen it laid down as a rule, that the cold will always be greatest where most snow has fallen

Perhaps, however, 4 or 5 inches may do as well as a yard for this purpose. Then I fancy that light snow recently fallen is better both as a non-conductor and as a radiator, than compact and hard snow. All the instances of great cold that I have noticed—not very many, though—have occurred very soon after a thick fall of light snow.

Then, again, it is generally agreed that plains and valleys are the most likely for great cold, but there may be exceptions. I hope, if no destructive tourists have got at the instrument, to be able to tell you the lowest temperature this winter on the top of Scawfell, 3200 feet above the sea. But this is by the way. Again, what influence have the soil, and the humidity and pressure of the air on the production of cold? I would suggest, therefore, that the following particulars should be noticed by those who send you these reports:—

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1. The state of barometer the day before, and that day.
2. The humidity on both days.
3. Whether any visible vapour or mist in the morning?
4. The direction and force of the wind the day before.
5. Whether any snow on the ground; and if so, the nature and depth of it, and the date of its falling.
6. The nature of the soil.
7. The configuration of the ground, and its elevation above the sea.

I may add a remarkable fact, that on Christmas Day, 1860, I observed a remarkable solar halo, and this year on January 1st, I observed parhelia at noon. Has the state of air which produced them, anything to do with the intense cold of both those days?—I am, Sir, your obedient Servant,

F. W. STOW, F.M.S.

THE FROST—DERIVATION OF "ANEROID."

To the Editor of the Meteorological Magazine.

DEAR SIR,—The article upon cold winters in your Magazine for this month is extremely interesting; but you seem to me to have done small justice to the claims of the long frost of January and February, 1855, lasting from the 15th of the former month to the 24th of the latter, and producing far more ice in the Thames than any other winter since 1838. The winter of 60-61 was not to be compared to it for continuous severity, although upon one particular day the cold was certainly more intense. In 1855 some gentlemen skated down the Thames, from Oxford to Barnes Bridge. In 60-61, the river was not closed even at Kingston. Again in 1855, the floating ice was so thickly packed, even as far as London Bridge, that the arches of all the other bridges were quite closed at low water, and it was stated in the papers that an active man with a pole had crossed above Blackfriars Bridge. Whether this was true I cannot say; but I know that some of the ships in the Pool were frozen in, and on the 19th of February, I walked on the ice off Billingsgate, and saw skittles played upon it. The ice in the Regent's Park was ten inches thick.

You state the probable minimum of that year as 11°. At 7 a.m. of February 18th, in Camden Town, (where I then lived), I saw the thermometer at 11°, no doubt it had been lower, but I had no self-registering then. Newspaper correspondents sent readings (I know) below zero; of course their thermometers may have been wrong, but they can scarcely have all been wrong to the extent of the error which you attribute (no doubt *justly*) to the Chiswick readings.

Excuse my random jottings. One of your correspondents asks for the etymon of the word "aneroid." I believe the derivation generally assigned (*a* and *νηρός*) is wrong. In the first place, the form of the word would in that case be aneric; for the addition of the termination *ειδης* (as indicating similitude) is not only uncalled for, but absurd, where the composite word is a privative. In the next place, *νηρός* or *ναρός*, is not a substantive but an adjective, and a very rare one. Had the object of the word coiner been to indicate absence of *moisture* (about the last thing which would occur to him as contradistinctive to quicksilver), he would doubtless have taken some form of *ὑγρός* for his basis.

Next, to suggest a more probable etymon: is not the true word *ἀνεροειδης* or *ἀνδροειδης*? "aneroid" or "android" (both forms exist) signifies an automaton, (see "Ogilvie's Comprehensive Dictionary"), something which, by internal springs, works as might a man. And the broader sense of the word automaton, is of anything self-acting, as if it contained its own motive power.

If I am right in this, "aneroid barometer" means simply a barometer of an automatic character.

Yet Ogilvie, on the heels of the right track, runs into error, and makes two distinct words, aneroid and aneroid, both of the same pronunciation, (in laying down which he is wrong, for aneroid=android *must* have the penultima short), and yet in no way connected!—With many apologies, I am, Sir, yours truly,

Teddington, Jan. 19, 1867. R. D. BLACKMORE.

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To the Editor of the Meteorological Magazine.

SIR,—The derivation you quote of the word aneroid from *a without*, *νηρος moist*, and *εἰδος form*, has astonished me a little. What on earth has a barometer to do with moisture in its principle of action, as signified by its name? The *Encyclopædia Britannica* with its *ἀνερομαι I enquire*, is equally absurd.

If you consult any of the French encyclopædias or scientific dictionaries (De Boulay's for instance), you will find that the inventor of the aneroid compounded the word precisely in accordance with the nature of the instrument, thus :—*a no*, *ἀηρ air*, *εἰδος form or shape*, that is "in the shape of no air, or a vacuum," the *ν* or *n* being put in, as usual in such Greek compounds, for the sake of euphony, as in the word *ἀνέρασστος unamiable*, from *a non*, and *ἐράω amo*. I need not state that the principle of the instrument is a cavity exhausted of air to the utmost, although, practically, not to a greater extent than that represented by about half-an-inch height of the mercurial column, under the action of the air-pump.

In Chambers's Cyclopædia, the derivation from *νηρὸς* (translated "wet") is said to be "anomalous"; but the writer goes on to say that the aneroid is a barometer in which the pressure is measured without the use of a liquid, as in ordinary instruments. Now by "ordinary instruments" must be meant the mercurial,—and, assuredly, mercury is no liquid, but only a fluid. Oddly enough, the second meaning of *νηρὸς* in the old lexicon of Schrevelius (which we tugged at in our young days) is *cavus* "hollow," which would make a much better derivation for aneroid, if we make the *a* intensive instead of privative, as occasionally done by the Greeks—*i.e.*, "very hollow."—Your obedient servant,

A. STEINMETZ.

To the Editor of the Meteorological Magazine.

DEAR SIR,—In reply to Mr. Taylor's query in your last, I beg to say, that the word *aneroid* appears to me one of a very base coinage; that the question about its etymology *is* hopeless. They only who invented it, can say what they meant by it. The word *νηρὸς*, *humid*, is mere lexicon Greek, though it seems still to be represented in the modern term *γέρο*, *water*. The only practicable derivation for *aneroid* would be from *ανέρος*, the old genitive of *ανὴρ*, but that of course would not do here.

T. F. BARHAM.

THE WEATHER AT CANNES.

To the Editor of the Times.

SIR,—I have passed some months here, not for my health, but solely for the purpose of cheating the English winter, and after the accounts I have had of the weather not only in England, but in almost every part of France, I cannot resist troubling you with a short statement, which I shall confine to the month of January, merely premising that during October, November, and December we had a bright sun, a cloudless sky, and an ultramarine sea, with only three rainy days.

The first five days of January were windy, with at times a severe mistral. On the 6th, heavy rain all day; the 7th cloudy, with a cold wind; the 8th and 9th fair, but rather cold. From the 9th to the 13th fine and very warm. On the 13th and 14th very heavy rain, nearly two inches having fallen in 40 hours. The 15th and 16th fine; on the night of the 16th the thermometer in a north aspect marked 32°. The 17th, bright sun, but at night the thermometer registered 29°—that is, 3° of frost; and this was the coldest night we have had. From the 18th to the 24th very fine, with a bright sun, and the greatest cold 39°. 24th to 25th, heavy rain; in six hours on the 25th one inch and a half of rain fell! From the 26th to the 31st most beautiful. In February, to the 7th, uninterruptedly fine.

Compare the above with the rain, cold, snow, frost, and thaw you have had in England, and even in France, where at Lyons there was 26° of frost, and at Marseilles and Pau nearly as much.

With the exception of the 16th and 17th, the night thermometer here has registered from 39° to 48°. It has only twice been as low as 39°.—I am, Sir, your most obedient servant,

Cannes, Feb. 7th. AN ENGLISH WINTERER AT CANNES.

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POSITIONS OF GAUGES,

WHENCE MONTHLY RETURNS ARE PUBLISHED.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Rain Gauge. Diameter.	Above Ground.	Above Sea Level.	Latitude.	Longitude.
			in.	ft. in.	feet.		
I.	ENGLAND.	Camden Town	8	0 6	100	51°33′N	0° 8′W
II.		Staplehurst (Linton Park)	8	0 6	296	51 13 N	0 31 E
,,		Selborne (The Wakes)	...	4 0	500?	51 6 N	0 56 W
III.		Hitchen	9	2 0	240	51 57 N	0 17 W
,,		Banbury	6	7 0	345	52 4 N	1 20 W
,,		Wisbech	8	0 6	10	52 40 N	0 10 E
IV.		Bury St. Edmunds (Culford)	5	1 2	...	52 17 N	0 42 E
V.		Calne	5	0 11	250	51 27 N	1 59 W
,,		Plymouth (Goodamoor)	5	0 2	580	50 25 N	4 0 W
,,		Barnstaple	8	0 6	31	51 4 N	4 4 W
,,		Taunton (Fulland's School)	5	1 4	...	51 1 N	3 6 W
VI.		Shrewsbury (Highfield)	5	5 6	200	52 42 N	2 46 W
,,		Tenbury (Orleton)	5	0 9	200	52 18 N	2 27 W
VII.		Leicester (Wigston)	8	0 6	220	52 35 N	1 6 W
,,		...	...	...	...	...	...
,,		Derby	5	5 0	180	52 55 N	1 28 W
VIII.		Manchester	8	2 7	106	53 28 N	2 17 W
IX.		York	5	0 6	50	53 58 N	1 5 W
,,		Skipton (Arncliffe)	8	3 0	750	54 9 N	2 6 W
X.		North Shields	8	1 0	124	55 0 N	1 26 W
,,		Borrowdale (Seathwaite)	5	1 0	422	54 30 N	3 12 W
XI.	WALES.	Abercarn	...	1 3	450	51 39 N	3 6 W
,,		Haverfordwest	5	2 0	60	51 48 N	4 55 W
,,		Rhayader (Cefnfaes)	5	2 0	880	52 18 N	3 32 W
,,		Llanberis (R. Victoria Hotel)	5	1 0	370	53 6 N	4 7 W
XII.	SCOTLAND.	Dumfries	5	0 5	70	55 5 N	3 36 W
,,		Hawick (Silverbut Hall)	...	4 0	512	55 26 N	2 46 W
XIV.		Ayr (Auchendrane House)	...	2 3	94	55 27 N	4 37 W
XV.		Otter House	...	0 6	130	56 1 N	5 20 W
XVI.		Leven (Nookton)	5	0 6	80	56 47 N	5 7 W
,,		Stirling (Deanston)	6	0 0	130	56 12 N	3 0 W
,,		Logierait	5	1 0	250	56 11 N	4 4 W
XVII.		Ballater	5	0 10	656	56 38 N	3 41 W
,,		Aberdeen	5	4 8	115	57 4 N	3 5 W
XVIII		Inverness (Culloden)	...	3 0	104	57 9 N	2 6 W
,,		Fort William	5	0 8	20	57 30 N	4 7 W
,,		Portree	3	0 4	60	57 24 N	6 13 W
,,		Loch Broom	5	0 8	48	57 47 N	5 5 W
XIX.		Helmsdale	5	1 0	34	58 7 N	3 38 W
,,		Sandwick	11	2 0	78	59 3 N	3 17 W
XX.	IRELAND.	Cork	10	6 0	65	51 54 N	8 30 W
,,		Waterford	..	4 0	60	52 16 N	7 6 W
,,		Killaloe	10	5 0	128	52 48 N	8 26 W
XXI.		Portarlington	5	1 2	236	53 10 N	7 10 W
,,		Monkstown	10	0 6	100	53 17 N	6 8 W
XXII.		Galway	10	6 0	25	53 17 N	9 3 W
,,		Bunninadden (Doo Castle)	5	1 0	...	54 3 N	8 38 W
XXIII.		Bawnboy (Owendoon)	5	1 3	218?	54 6 N	7 44 W
,,		Waringstown	8	0 4	191	54 26 N	6 18 W
,,		Strabane (Leckpatrick)	8	0 5	260	54 58 N	7 26 W

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JANUARY, 1867.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Date.	Days on which .01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of nights below 32°.
			inches	inches.	in.							
I.	ENGLAND.	Camden Town	2·81	+ ·85	·51	30	16	56	27	6·7	4	19
II.		Staplehurst (Linton Park)	3·05	+ ·99	·57	2	18	57	28	10	5	21
,,		Selborne (The Wakes)	4·11	+ ·84	·63	5	17	50	27	—2	3	20
III.		Hitchen	3·01	+ ·87	·62	30	19	53	27	9	§3	18
,,		Banbury	3·03	+ ·94	·53	30	17	53·7	27	12	4	19
,,		Wisbech	3·03	...	·87	30	18	56	†27	12·3	4	20
IV.		Bury St. Edmunds (Culford)	2·73	+ ·86	·87	30	12	56	27	0	1	19
V.		Calne	3·34	...	1·12	6	11	55	24	1·5	5	19
,,		Plymouth (Goodamoor)	7·74	+1·72	1·46	6	19	52	26	8	2	16
,,		Barnstaple	5·89	+2·37	·92	26	17	...	...	...	...	...
,,		Taunton (Fulland's School)	4·85	...	·90	6	16	...	...	9	‖5	17
VI.		Shrewsbury (Highfield)	2·33	+ ·61	·38	11	13	...	...	6	5	...
,,		Tenbury (Orleton)	3·83	+1·30	·60	7	19	56·5	27	1·6	4	19
VII.		Leicester (Wigston)	3·24	+1·26	·73	8	9	55	‡24	9	3	...
,,		West Retford	...	...	...	...	...	...	...	...	...	...
,,		Derby	2·91	+1·12	·37	5	16	55	27	13	¶4	20
VIII.		Manchester	3·27	+ ·76	·50	7	15	56	27	9	15	21
IX.		York	2·23	+ ·64	·97	24	11	52	27	10	5	19
,,		Skipton (Arncliffe)	7·35	+1·71	1·00	7	18	46	27	8	4	20
X.		North Shields	3·61	+1·49	·57	10	18	52	28	14	2	17
,,		Borrowdale (Seathwaite)	15·66	— ·70	3·28	7	17	...	...	...	...	...
XI.	WALES.	Abercarn	7·95	...	1·79	6	12	53	7	20	3	16
,,		Haverfordwest	7·11	+2·06	1·33	23	13	...	...	8	15	8
,,		Rhayader (Cefnfaes)	4·96	+ ·44	1·29	6	12	55	...	7	3	14
,,		Llanberis (R. Victoria Hotel)	11·46	...	2·07	7	17	...	...	...	...	...
XII.	SCOTLAND.	Dumfries	3·11	—1·49	·97	23	12	55	27	14·5	4	19
,,		Hawick (Silverbut Hall)	2·94	...	·44	8	25	...	...	...	...	22
XIV.		Ayr (Auchendrane House)	4·55	+ ·03	·88	26	15	57	29	7	15	21
XV.		Otter House	5·03	—1·67	1·28	27	13	50	29	21	12	21
XVI.		Leven (Nookton)	4·11	...	·40	26	23	...	...	...	...	...
,,		Stirling (Deanston)	4·01	—1·71	·65	26	18	48·8	25	10	15	25
,,		Logierait	4·02	...	·65	29	12	...	...	...	...	...
XVII.		Ballater	5·88	...	1·10	8	27	47·5	28	—5	5	23
,,		Aberdeen	6·21	...	·65	12	27	47·3	26	10·2	5	18
XVIII		Inverness (Culloden)	5·07	...	1·36	18	...	47	31	14·6	5	17
,,		Fort William	5·84	...	1·23	26	14	51·2	28	7·2	15	21
,,		Portree	7·82	—5·27	1·55	23	16	51·5	27	12	5	20
,,		Loch Broom	4·27	...	1·25	8	16	...	...	...	...	...
XIX.		Helmsdale	4·62	...	·63	24	26	...	...	...	...	...
,,		Sandwick	4·06	+ ·77	·78	7	27	...	..	...	...	...
XX.	IRELAND.	Cork	5·12	...	1·95	5	13	...	...	...	...	...
,,		Waterford	3·55	—1·31	1·10	6	17	52	7	16	4	18
,,		Killaloe	3·82	—1·04	·50	*8	14	54	27	14	18	17
XXI.		Portarlington	2·32	—1·69	·29	7	21	51	28	8	18	19
,,		Monkstown	3·90	+ ·51	1·70	5	21	57	27	12	4	17
XXII.		Galway	4·77	...	·75	6	17	53	31	15	3	17
,,		Bunninadden (Doo Castle)	09.9	...	...	...	...	...	...	...	..	...
XXIII		Bawnboy (Owendoon)	5·58	...	·97	5	15	...	...	...	...	...
,,		Waringstown	4·50	...	·81	5	18	54	27	2	2	20
,,		Strabane (Leckpatrick)	5·56	...	·84	13	24	53	27	4	4	20

* And 22nd. † And 28th. ‡ And 27th. § And 4th. ‖ And 15th. ¶ And 14th & 15th.

+ Shows that the fall was above the average; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail.

ENGLAND.

CAMDEN ROAD.—Frosty at intervals throughout the month.

LINTON PARK.—The intense frosts of the 3rd, 4th, and 5th, were followed by a few mild days, commencing with the 7th; another severe frost followed on the 14th, being only 2° higher than on the coldest day in the former period; the last week very mild. The frost appears to have been very capricious in its action, as a difference of 10° lower than mine was registered at a place a very short distance from hence. High wind on 8th, doing much damage and of course a very low bar. accompanying it. The snow drifted on 2nd and 16th, rendering the roads impassable in places. A high flood followed the breaking up of the first fall of snow, which, however, was not so high as a similar one in January, 1866.

SELBORNE.—First snow this winter on 1st. Ther.—2° on 3rd (at Chawton House —5°), lower than it has been for 6 years; the evergreens very much injured, especially the laurustinas, ilex-catyolia, darwinia, laurels, and deodar.

BANBURY.—Snow on 1st, 5th, 6th, 12th, and 16th; at 7.30 p.m. on 22nd sleet and frozen R. Fog on 4th, 6th, and 25th.

WISBECH.—Snow on 1st, 3rd, 11th, 12th, 14th, to 19th. The 2nd, 4th, 5th, and 14th the coldest days in the month. Temp. not below freezing after the 23rd. Max. in sun 89°·7 on 27th. On 30th, at 4 a.m., gale pressure 10lbs. per square foot.

CULFORD.—Snow on 2nd, 5th, 10th, 12th, to 17th. The coldest January we have had for many years. Min. (5 ft. above ground against house) 9°, on a stake in open space) 1ft. 6in.+ground) zero, and on the snow close by—7°; the instruments were all tested instruments and have been found always to work well together and indicate alike; pray settle what height they ought to be placed. [Thoroughly protected from the sun and rain, on a post 4 ft. high.]

CALNE.—Hard frost from 1st to 6th, and from 11th to 22nd. Snowdrops and winter aconite in bloom on 25th, and hepatica on 31st.

GOODAMOOR.—Gale from S.W. on 8th. A very thick fog came on just before the thaw on the 22nd.

TAUNTON.—Four inches of snow on the 2nd. Severe frost on 5th and 15th. Rapid thaw with Southerly wind, on 23rd.

ORLETON.—Severe frost set in on the 1st and continued till the 5th. Ther. on 4th 1°·6 in shade and—1°·7 (below zero) 5 in. above grass. Snow on the night of the 5th, followed by rapid thaw, much R, and great floods; on the 7th, much R with T and L. Bar. on 8th, uncorrected, 28·38 at 9 a.m. Frost set in again on the 11th and continued with severity till the 22nd. Great wind and cloudy sky on 20th and 21st. On the night of 22nd snow, changing to sleet and rain, fell and froze upon the snow; at 9 a.m. thaw commenced with frequent showers. Warm stormy weather to the end of the month; very warm on the 27th and 28th; the temperature of the month in extremes, but upon the whole about 1°·4 below the average. L at night, on 26th.

MANCHESTER.—Heavy snow on 12th.

ARNCLIFFE.—Snow fell on the 1st and remained on the ground, with severe weather, till the 23rd.

SEATHWAITE.—Very severe frost from 10th to 23rd; Bassenthwaite and Derwentwater Lakes frozen from end to end affording splendid skating. R on Stye 21·82; Taylor's Gill, a new station, 18·10.

WALES.

ABERCARN.—Snow on 1st, 2nd, 5th, and 14th, with R on 22nd. Bar. was 28·4 on 7th, the lowest since February 11th, 1866. A very severe month; several sudden changes of temp. being very trying to the weak and the aged; mortality above the average.

HAVERFORDWEST.—First five days severe. Month commenced with snow and frost, which terminated in a fearful gale, on the 5th, of violence such as few can

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remember; a few days of wet and storm ushered in a second much more severe frost with heavy snow, averaging from 7 to 8 inches on the level; I have no record of so severe a frost as the present, except the frosty period included between the 10th and 20th of February, 1855, when the mercury sunk to 8°; this second frost broke up on the 22nd, accompanied by a severe gale from the S.E. and immense quantities of rain; the month very wet and mild towards the end.

CEFNFAES.—Snow fell on the night of the 1st, 10 in. deep on the level. Ther. on 3rd under shelter, but exposed to the east, stood at 7°. Shrubs and all evergreens except rhododendrons very much injured, common laurels more especially so. Many instances of persons suffering from exposure, hands and feet being frost-bitten.

SCOTLAND.

DUMFRIES.—The first five days frosty; snow on the 6th, and thence to the 9th wet; 10th to 22nd frosty; from 23rd to the end of the month wet. Temp. 14°·5 on morning of 4th. Bar. on morning of 8th, only 28·39 in. Beautiful sunrise on morning of 26th. Snowdrops in flower on 29th.

SILVERBUT HALL, HAWICK.—The severest snowstorm experienced here for many years; the frost has been the keenest felt here since 1860; roses, deodars, and auracarias have suffered terribly, and many favorite pine trees are injured beyond recovery. T and L on night of 29th.

AUCHENDRANE.—11th snow fell between 11 and 12, and was measured at 9 a.m. on 12th 4 in. deep; this was the great snowfall of the month, and extended over a large district; here it was not severe, but the snow continued on the ground till the thaw of the 23rd.

OTTER HOUSE.—The month began with a severe frost, which lasted several days. On the 13th a snowstorm with intense frost; the ground covered with snow to the depth of 2 in. till the 22nd when a thaw set in; afterwards every day but one was wet. The month was remarkable for snow, frost, and towards the end R.

DEANSTON HOUSE.—As the first fall of snow had melted, the want of it was severely felt by garden vegetables during the second frost, but there is not yet any appearance of damage to plants or trees.

LOGIERAIT.—Very severe frost from 31st of December to 6th January, on which day a heavy fall of snow; from that date till the 27th, with one brief interval of uncertain thaw, very intense frost and repeated falls of snow, forming the most severe storm we have experienced for many years; a very rapid thaw and heavy falls of R since the 27th have considerably swollen the Tay.

BALLATER.—Remarkably stormy month with occasional intense frosts. 5° below zero on the 5th; depth of snow from 2 to 3 feet. Railway communication with lower districts suspended for a time from the accumulation of snow in the cuttings. Thaw commenced on the 23rd, and by the end of the month most of the snow on the lowlands was gone. Vivid flashes of L in N. from 7 to 9 p.m. on 29th; aurora at midnight of 30th. With reference to Mr. Bewley's communication in last month's magazine: the meteor he mentions, and the peculiar forms it assumed was noted here, although not minutely, the time being occupied in an attempt to count the shooting stars; it remained for 10 minutes or more, and could readily be picked up again, although the eye had for some time been directed away from it.

ABERDEEN.—A month of terrible weather; there has been no such storm here since 1838; ground round Aberdeen white with snow on 24 days. Temp. of month 4°·2 below the mean of the month for 10 years, and lower than the mean of any January for that period. On the morning of the 22nd about 27 or 30 in. of snow was lying all round town, but it disappeared very rapidly. In the country there were many places were the snow had drifted to the depth of 15 or 20 feet. L on 29th in evening.

FORT WILLIAM.—The first 3 weeks were for the most part, clear and frosty, with a little R now and then, and a good deal of snow; on the 11th and 13th the fall of snow, however, was not as heavy as in most other parts of the kingdom, and postal communication with the S. was never delayed for an hour; thaw set in on the 23rd. A gale from S. on 29th, with a good deal of L and some T.

PORTREE.—This has been a very severe month for all sorts of stock that were exposed to the late severe storm, which has not been equalled for 30 or 40 years,

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The first snow fell as the old year went out and the new one came in, and continued till the evening of the 5th, when thaw set in, and we had it mild till 4 a.m. of 10th, when it again fell and continued, more or less, till the 20th, when there was 2 feet of snow all over; thaw set in on 23rd, and since then the weather has been wet and squally. T and L at noon 28th.

LOCHBROOM.—The frost which commenced at the end of December continued with almost unabated intensity till the 23rd, when a mild and much required thaw set in and continued till the end. Seldom has the county been more thoroughly locked from stock by frost and snow, the latter being, most unusually, as deep on the sea islands as on the elevated mainland, showing the want of drift and the severity of the frost both at the time of snowing and during its continuance; a month equally severe has not been experienced here for the last 20 years, though it appears to have been far worse in other localities.

HELMSDALE.—From the 9th to the 21st Helmsdale was visited by the severest snow storm experienced in this district for very many years.

SANDWICK.—The coldest January for 40 years. On the morning of the 6th we had again the snow-rollers, which were seen forming in front of the house at 9 a.m.; there were about 100 of them on the lawn at the lee end and in the shrubbery, the wind being apparently too strong for them in the open fields, the largest was 2 feet long and 20 in. in diameter, which is far from the size we have formerly seen; the circumstances attending their formation this time were just the same as I formerly mentioned, viz., 1st a fall of snow flakes on the top of a previous fall which yields a smooth surface for it to be rolled on; 2nd a temp. about 32°, which gives adhesion to the snow without thawing it; 3rd, a strong breeze of wind.

IRELAND.

KILLALOE.—Not much snow here, but what there was continued to lie between 2 and 3 in. deep; all snow disappeared before the 21st.

MONKSTOWN.—On 5th the heaviest fall of R I ever measured, 1·70. The month commenced with sharp frost and snow; the weather throughout was unusually severe; except from the 6th to the 10th, and from the 24th to the end; the night of the 5th will long be remembered as the most severe here for many years; it was blowing wildly from the S.E. up to 2 p.m., after that it increased to a perfect hurricane accompanied by blinding showers of sleet which partly thawed, covering the ground to a considerable depth. After the thaw commencing on the 6th, the frost returned on the 11th, and a good deal of snow fell up to the 19th, when it was 10 or 12 in. deep; on the morning of the 23rd a rapid thaw commenced. *Latest Intelligence.*—The mild weather continued to the evening of the 6th February, and on the morning of the 7th the mountains were again coated with snow.

WARINGSTOWN.—The frost which set in on the 1st has been here the most intense in the memory of anyone now alive, and the injury to evergreens, &c., greater than on any previous occasion; it was followed by a rapid thaw, the temp. of the 6th being unusually high; the frost, however, set in again, accompanied as before with snow, and though not quite so intense as the first, was more severe than any of late years, as well as more lasting. The min. was 5° lower than in 1859-60.

LECKPATRICK.—On 2nd grass min. was covered with 6 in. snow, and read 30°, while exposed one registered 12°, so that the cover of 6 in. snow = a protection of 18°. On night of 4th-5th a gale from S.E., blowing the snow into drifts; on that night two men lost their lives near this house: one was stopped by storm in driving, took out his horse, wandered from the road, and was found dead in a field, the horse took shelter under a ditch-hedge and survived. On the morning of 5th the garden-gate was so blocked by snow that we had to get over the wall by a ladder to get to the instruments. Thaw set in on 20th with S. E. wind; many shrubs much damaged, some killed. The severest month ever remembered. *Query*—With reference to the above mentioned reading of the thermometers, should all snow be swept away from about the instruments, and should the grass min. be laid on grass, or on the top of the snow? [So far as we are aware no instructions have been issued on this point; our own practice (perhaps improper) is to place the thermometer on the top of the snow.—ED.]

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

XIV. MARCH, 1867. [PRICE FOURPENCE, or 5s. per ann. post free

THE FROST OF JANUARY, 1867.

OWING to the somewhat excessive length of the tables which we have compiled upon the above subject, our remarks must be rather brief. In the first place, we must thank our numerous correspondents for having enabled us to make the tables so complete, and remind our readers that while we take all practicable measures for the exclusion of all but thoroughly reliable observations, we cannot be responsible for the absolute accuracy of every one.

Before proceeding any further we should state, once for all, that every reading is to be understood as plus unless marked minus. Great and most troublesome confusion has been introduced by some persons speaking of so many degrees of frost, until they themselves hardly know whether 10° represents 10° below freezing, *i.e.* 22°, or 10° below zero, *i.e.* —10°; or 10° above zero, *i.e.* 10°. If Fahrenheit's scale is bad, let us combine and choose a better one if we can—but if not, then for our own sake, and for mutual advantage, let us eschew *in toto* degrees of frost, and speak of temperatures solely as they stand on the scale.

It is especially necessary that this point be clearly understood, because many of our readers will doubtless be surprised to see temperatures of —10°·0, or even less, recorded at a score of English stations. Strange it may be to find that our temperature is occasionally 40° or 50° below the freezing point of water, but it is undoubtedly true. (We thus express it for the benefit of those who cannot all at once abandon their false notation.)

Table I. is compiled from returns received in reply to the suggestion on page 104 of our last volume. The principal remarks it needs are explanatory. Under each station is stated in the first column the lowest temperature, in the second the day or days on which it occurred —the months are indicated by the Roman numerals, and the day of the month by ordinary figures. Thus, by way of example, we may explain that at Haverfordwest in 1858 the lowest temperature was 22·5 on the 18th of November, and in the same year at Red Hall, Leeds, the lowest temperature was 19°, and it occurred twice, on the 1st of March, and again on the 24th of November.

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TABLE I.—MINIMUM TEMPERATURES, 1846—1867.

	Haverfordwest.		Killaloe.		Pen-y-maes, Brecon.		Dumfries.		Red Hall, Leeds.		Wolverhampton St. John's Sq.		Camden Town.		Sheering, Harlow.		Bristol, Frenchay.	
Year.	Deg.	Date.	Deg.	Date.	Deg.	Date.	Deg.	Date.	Deg.	Date.	Deg.	Date.	Deg.	Date.	Deg.	Date.	Deg.	Date.
1846	16·0	XII. 16	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...
7	19·0	II. 19	18·0	II. 13	..	...	...	...	...	...	...	...	...	...	...	...	...	...
8	14·0	I. 27	20·0	I. 31	...	...	...	...	...	...	...	...	...	...	...	..	...	...
9	29·0	I. 2	20·0	XII. 30	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1850	...	...	15·0	I. 17	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1	22·0	XII. 1	25·0	XI. 29 XII. 20	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	24·0	III. 27	22·0	I. 10	...	...	...	...	...	...	...	...	...	...	..	...	...	...
3	17·0	II. 19 XII. 28	21·0	II. 8, 13 XII. 17	22·0	XII. 29	...	...	...	...	...	...	..	...	...	...	...	...
4	22·0	XI. 26	21·0	I. 16	22·0	I. 3	14·5	I. 3	...	...	...	...	...	...	...	...	...	...
5	8·0	II. 10	14·0?	II. 15?	12·0	II. 15	9·0	II. 16	18·0	XII. 22	...	...	...	...	...	...	...	...
6	16·0	XII. 27	18·0	I. 13	15·0	XII. 8	9·0	XII. 28	17·5	XII. 28	13·0	XII. 28	...	...	...	...	...	...
7	20·0	II. 3	22·0	I. 29	30·0	XI. 24	14·0	II. 4	11·5	I. 30	13·0	I. 29	...	...	...	...	...	...
8	22·5	XI. 18	21·0	I. 22	27·0	I. 5	18·0	II. 1	19·0	III. 1 XI. 24	22·0	I. 5	20·1	XI. 24	...	...	...	...
9	8·0	XII 17, 19	14·0	XII. 18	17·0	XII. 18	11·0	XII. 17	15·0	XII. 19	9·0	XII. 19	14·4	XII. 17	-1·0	XII. 17	...	..
1860	10·0	XII. 23	13·0	XII. 24	9·0	XII. 24	-1·5	XII. 24	11·0	XII. 25	6·0	XII. 25	6·7	XII. 25	-2·0	XII. 25	..	...
1	9·0	I. 6	23·0	I. 3	13·0	I. 7	6·5	I. 7	12·0	II. 13	17·0	I. 7	14·3	I. 9	6·0	I. 8	6·0	I. 7
2	20·9	II. 9	24·0	XI. 25	29·0	XII. 20	17·0	XI. 25	19·0	I. 19	22·0	I. 19	18·1	I. 19	19·0	I. 19	18·5	XI. 23
3	24·0	I. 16	...	...	30·0	XII. 11	23·5	II. 15	...	...	28·0	XII. 28	24·5	II. 17	24·0	II. 17	...	...
4	10·0	I. 5	20·0	XII. 26	22·0	XII. 5	17·0	I. 6	14·0	I. 8	15·0	I. 7	15·1	I. 6	20·0	II. 9, 10, 24	19·5	XII. 18
5	14·0	I. 24	18·0	I. 28	12·5	XII. 29	9·5	II. 15	...	...	18·0	I. 29	15·4	II. 15	14·0	I. 29	10·0	I. 29
6	18·5	II. 28	23·0	II. 18	26·0	III. 1	19·0	III. 5	...	...	24·0	III. 2	22·5	III. 1	17·0	I. 13	19·7	III. 1
1867	8·0	I. 15	14·0	I. 18	6·0	I. 15	14.5	I. 4	...	...	16·0	I. 15	6·7	I. 4	7·0	I. 4	9·0	I. 4

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This table is not so complete as we could wish, but seems just sufficient to indicate that if it were thrice as large some interesting results as to the progress of cold tracts of air might be deduced.

Table II. contains the whole of the returns hitherto received (about 170), arranged according to the counties in which the observations were made. It would, in some respects, have been desirable to arrange them according to the intensity of the frost, but the opportunity of discussing the observations would have been thereby impeded. Moreover, a glance at either Table II., III., or IV. will show that it was, as previously stated, most severe in the Home Counties. Low temperatures will be noticed in other parts, but *they* mostly occurred about 14th, 10 days after the first frost. A column gives (where known) the elevation of the station above the sea, the effect of which is, we believe, popularly considered just the reverse of the truth. Take, for instance, the returns from Kent: the two highest stations, Goudhurst and Wrotham, had a min. of 21°; the stations of medium height, say 250 ft., had a mean of 5°·0; and those under 100 ft. a mean of —5°·0. In Westmoreland, at 300 ft., the min. was 5°·5, and at 1,550 ft., it was 14°·0.

Table III. compares the intensity of the frosts of 1860 and 1867 at stations where observations were made in both years, and Table IV. effects the same object, by showing the very large number of excessively low temperatures recorded in 1860.

TABLE II.—*General Table of Low Temperatures in January*, 1867.

STATION.	Above Sea.	Degree.	Date.	REMARKS.
MIDDLESEX.—Pinner Hill	410	8·0	4th	12°·0 on 3rd and 12th.
Staines	52	— 7·0	4th	—4°·0 on 2nd.
Winchmore Hill.....	...	— 4·0	4th	1·0 on 5th. 3°·0 on 3rd.
Hackney (Town Hall)	40	6·8		
,, (London Fields).....	30	5·0		
Hammersmith Royal Vineyard Nursery	...	— 3·0		
Hornsey	...	— 3·0	4th	
Camden Town.....	100	6·7	4th	
SURREY.—Walton-on-Thames (Oaklands)	...	0·0	5th	
East Sheen	...	— 3·0	4th	(Ther. only 1 ft. above snow.)
Cobham Lodge	100	— 3·0	5th	
,, (Pyports)	...	— 6·8	5th	—4°·9 3rd.
Epsom	135	—12·0	4th	3°·0 on 2nd; 10°·0 on 3rd.
Bagshot Park	230	3.0		
,, *grass*	...	— 2·0		
Wimbledon.....	170	5·0	3rd	8°·0 on 4th.
KENT—Greenwich Observatory..	160	6·6		
East Peckham.....	76	—10·0	5th	—6·0 4th; zero 3rd.
Bromley Common	250	— 3·0	4th	2·0 5th.

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STATION.	Above Sea.	Degree.	Date.	REMARKS.
KENT (*con.*)—Beckenham	157	0·0	5th	4·0 4th.
Maidstone	60	0·0	5th	
Goudhurst	375	20·5	3rd	21·5 on 4th
Cranbrook (Hartley)	...	10·0	4th	12°·0 on 3rd and 5th.
Wrotham (Fairseat)	650	21·0	4th	
Tunbridge	71	— 5·0	4th	2°·0 on 3rd; 4°·0 on 5th.
Linton Park	296	10·0	5th	
SUSSEX—Uckfield	149	4·0	4th	
,, *grass*	...	— 2·6	4th	
,, (Framfield)	200 ?	6·5	4th	
Hastings (Ore)	380	13·0	3rd	14°·0 on 14th.
Chichester (Chilgrove)	284	12·0	4th	14°·0 on 14th.
HAMPSHIRE—Isle of Wight (Ryde)	15	21·0	14th	23°·0 on 4th.
,, (St. Lawrence)	200	17·0	13th	21°·0 on 3rd.
,, (Newport)	...	14·8	14th	
Southampton (Woolston)	...	7·0	4th	
,, (Shirley Warren)	110	4·0	4th	
,, ,, *grass*	106	2·9	4th	
,, (Ord. Sur. Office)	75	4·2	4th	9°·1 on 14th.
Selborne	500 ?	— 2·0	3rd	
,, (Chawton House)	...	— 5·0		
Strathfield Turgiss, *grass*	269	— 3·0	3rd	
BERKSHIRE—Maidenhead	...	— 3·0		
,, (Cookham)	...	0·0	4th	1°·0 on 3rd; 1°·5 on 5th.
,, (Ray Lodge)	...	— 3·0	5th	—2·0 on 4th.
Wantage	185	3·0	5th	6°·0 on 4th.
Wallingford	...	— 5·0		
Long Wittenham	170	6·0	4th	
Old Windsor, (Woodside)	...	4·0	5th	
HERTS—Berkhampstead	370	0·5	5th	2°·2 on 4th; 4°·5 on 3rd; 1855, II., 18, 0°·8.
Harpenden	...	— 6·0	5th	
Kensworth	902	10·0	4th	
Berkhempstead, Hawridge	600	— 8·0	13th ?	
Ware (Braughing)	...	— 6·5	3rd	—3°·0 on 4th.
Hitchin	240	9·0	3 & 4	
BUCKS—Datchet (Riding Court)	...	— 8·0	5th	
OXFORD—Dorchester	...	— 2·0	4th	
Banbury	345	12·0	4th	
NORTHAMPTON—Ashby St. Ledger	...	14·5	4th	
CAMBRIDGE—Wisbech	14	12·3	4th	
ESSEX—Dunmow (High Roding)	250 ?	11·0	4th	
Saffron Walden	...	5·0	4th	
,, ,, (Audley End)	...	5·4	4th	7·1 on 2nd; 9°·4 on 5th.
Harlow (Sheering)	100 ?	7·0	4th	
SUFFOLK—Bury St. Edmunds (Culford)	...	4·0	1st	
,, *grass*	...	— 7·0	1st	
NORFOLK—Lynn (Hillington)	...	3·0	4th	
Norwich (Cossey)	...	4·5	5th	
WILTS—Calne	255	1·5	5th	
DORSET—Bridport	85	11·0	...	
Upwey	70	15·3	3rd	
,, *grass*	...	12·2	3rd	
DEVON—Bideford (Pillhead)	25	8·0	15th	
Sidmouth (Belgrave)	26	16·6	14th	19°·7 on 3rd, 21°·6 on 4th.
,, Town	...	20·2	14th	

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STATION.	Above Sea.	Degree.	Date.	REMARKS.
DEVON (*con.*)—Exeter	140	9·0	4th	
Torquay (Sandhurst)	..	15·0	13th	
,, (Woodfield)	150	22·0	12th	
Goodamoor	580	8·0	2nd	
CORNWALL—Launceston (Trebartham Hall)	...	5·0	4th	
,, (Altarnum)	570	4·0	15th	
,, ,, *grass*	...	2·0	15th	
Bodmin	325	11·0	17th	lowest in 17 years, 1855 II, 12°.
Truro	56	8·0	15th	1855 I. 19 10°; 1859 I. 23 9°0.
SOMERSET—Street	...	3·5	...	
Taunton (Fulland's School)	...	9·0	5 & 15	
,, (College School)	...	10·0		
Bath	54	8·5	4th	14° on 15th.
GLOUCESTER—Cheltenham	...	5·0	4th	
Boyce Court	...	7·0	4 & 5	
Bristol (Frenchay)	...	9·0	4th	
,, ,, *grass*	...	— 4·5	4th	
Witcombe Court	225	— 3·0	5th	
Clifton	192	14·1		
HEREF'D—Leominster W. Lodge	229	3·0	4th	4°·0 on 5th
Ross	200	9·0	4th	10°·0 on 5th.
SALOP—Bridgnorth	...	1·0	5th	4°·0 on 4th.
Weston-under-Lyzziard	...	8·5	4th	
Shrewsbury	200	6·0	5th	
STAFFORD—Sugnall Hall	...	— 5·0	4th	
Wolverhampton, St. John's Sq.	513	16·0	15th	18°·2 on 3rd ; 18°·3 on 4th.
WORCESTER—Tenbury (Orleton)	200	1·6	4th	1865, I., 29, zero.
,, *grass*	...	— 1·7	4th	1865, I., 29, —2·0.
Bromsgrove	273	2·3	4th	
Evesham (Lansdowne)	...	10·0	4th	
WARWICK—Leamington	195	12·5	4th	13°·4 on 5th.
Birmingham	340	12·7		
LEICESTER—Wigston	220	9·0	3rd	
Leicester	230	11·0		
LINCOLN—Brigg (Appleby)	60	4·9	2nd	8°·6 on 4th, 5°·0 on 5th.
,, *grass*	...	2·8	2nd	5·2 on 4th ; 3·5 on 5th.
NOTTS—Nuthall	...	5·0		
Highfield House	166	9·0	14th	
,, ,, *grass*	...	2·7	14th	
DERBY—Derby	180	13·0	4,14,15	
LANCASHIRE—Liverpool	22	16·3		
Manchester (Eccles)	145	9·0		
,, (Old Trafford)	106	8·7	15th	
Stonyhurst	381	10·0		
YORK—Beadlam Grange	192	10·0	15th	
Skipton (Woodlands)	430	3·6	3rd	
,, (Arncliffe)	76	8·0	4th	
Middlesboro'	21	10·0	3rd	
Ripon	...	1·0	1st	
,,	116	2·0	2nd	
,, *grass*	...	— 9·5	2nd	
Sheffield	337	15·5		
Wakefield	115	5·0		
Malton	73	6·0		
York	50	10·0	5th	
Hull	14	8·0	1st	10°·0 on 4th.

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Stations.	Above Sea	Degree.	Date.	Remarks.
Northumberland—N. Shields	124	14·0	2nd	
Newcastle	150	12·0		
Chathill	...	24·0	4th	
Westmoreland — Kirkby Lonsdale (Casterton)	267	5·5	3rd	
Ullswater (Greenside)	1550	14·0	14th	
MONMOUTH, WALES, AND THE ISLANDS.				
Monmouth—Abercarn	450	20·0	3rd	
Chepstow (Winwood Green)	200	17·0	5th	
Pembroke—Haverfordwest	85	8·0	15th	
Glamorgan—Cardiff (Routh)	...	14·0	4th	15°·0 on 14th.
Brecon—Pen-y-maes	400	12·0	4th	
Radnor—Rhayader	880	7·0	3rd	
Denbigh—Llandudno	99	20·7	5th	
Carnarvon—Port Madoc	20	12·0	3rd	
Channel Isles—				
Guernsey (Grange Road)	150	20·0	14th	lowest for 20 years.
,, ,, ,, *grass.*	..	15·0	14th	lowest for 20 years.
SCOTLAND.				
Dumfries—Dumfries	70	14·5	4th	
Carlesgill	370	— 0·3	4th	
Roxbro'—Galashiels (Wooplaw)	890	5·0	1st	
Edinburgh—March Hall	270	16·0		
Leith	50	24·0		
Lanark—Lanark	505	5·0		
Glasgow (Cessnock Park)	30	5·0	14th	
,, (Observatory)	200	13·0		
Ayr—Auchendrane	94	7·0	15th	
Renfrew—Greenock	50	22·0		
Paisley	88	12·0		
Argyll—Otter House	130	21·0	12th	
Mull (Bunessan)	30	24·0	4th	
Perth—Deanston	130	10·0	15th	
Forfar—Dundee (Westfield)	...	21·0	5th	
,, (Cemetery)	...	19·0		
Aberdeen—Ballater	656	— 5·0	5th	
Aberdeen	115	10·2	5th	
Inverness—Culloden	104	14·6	5th	
Fort William	20	7·2	15th	
Portree	60	12·0	5th	
IRELAND.				
Waterf'd—Waterf'd (Newtown)	60	16·0	4th	
Clare—Killaloe	123	14·0	18th	
Kilkenny—Stoneyford (Inisnag)	196	11·0	18th	
Queen's Co.—Portarlington	236	8·0	18th	
Dublin—Monkstown	104	12·0	4th	
Dublin	35	14·0	4th	
Galway—Galway	25	15·0	3rd	
West Meath—Mullingar	...	11·0	3rd	12·0 on 4th.
,, *grass.*	...	— 4·0	4th	1°·0 on 3rd.
Down—Waringstown	190	2·0	2nd	
Antrim—Ballymoney	...	1·0	4th	
Tyrone—Leckpatrick	260	4·0	4th	

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TABLE III.—*Returns from the same Stations in the two (or three) frosts.*

STATIONS.	Lowest temperature in the Years.			STATIONS.	Lowest temperature in the Years.		
	1838	1860	1867		1838	1860	1867
Hammersmith	0·0	— 2·0	— 3·0	Bath	...	8·5	8·5
Hackney	...	5·6	6·8	Clifton	...	7·1	14·1
Camden Town	...	6·7	6·7	Boyce Court	...	— 5·0	7·0
Walton-on-Thames.	...	11·0	0·0	Witcombe Court.	...	2·0	— 3·0
,, ,, ,,	—14·0	...	...	Orleton	...	3·0	1·6
Cobham Lodge	...	6·0	3·0	Bromsgrove	...	0·3	2·3
Greenwich Observ.	— 4·0	8·0	6·6	Birmingham	...	— 1·0	12·7
Maidstone	...	10·0	0·0	Appleby (Lincoln)	...	—11·0	4·9
Uckfield	...	6·6	4·0	Nottingham	...	— 6·0	9·0
Selborne	...	— 1·5	— 2·0	Derby	...	2·0	13·0
Maidenhead	...	5·0	— 3·0	Eccles	...	— 3·0	9·0
Wallingford	— 5·0	0·0	— 5·0	Old Trafford	...	— 3·0	8·7
Berkhempstead	...	4·0	0·5	Wakefield	...	— 4·5	5·0
Ware	...	— 4·0	— 6·5	York	...	— 4·0	10·0
Dunmow	...	2·0	4·0	Malton	...	— 6·0	6·0
Calne	...	2·0	1·5	Chepstow	...	11·0	17·0
Upwey	...	11·5	15·3	Carlesgill	...	—12·0	— 0·3
Exeter	...	13·7	9·0	Paisley	...	— 5·0	12·0
Bodmin	...	14·0	11·0	Aberdeen	...	7·0	10·2
Truro	...	11·0	8·0	Mean	...	2·3	5·4

TABLE IV.—*List of Temperatures below* —5·0 *Fahrenheit.*

1838.		Chatsworth	—12·0
Walton-on-Thames	—14·0	Willersley	— 6·0
Claremont	—12·0	Tarporley	— 8·0
Beckenham	—13·5	Sale	— 9·8
1860.		Thelwall	— 6·0
Newbury	— 6·0	Thorpe Perrow	—12·0
Moulsford	— 6·4	Bedale	—11·0
Ball's Park, Hertford	—10·0	Doncaster	— 8·0
Tyttenhanger	— 6·0	Malton	— 6·0
St. Neot's	—12·5	SCOTLAND. Milne Graden	— 5·6
Saffron Walden	—12·0	Smeaton	— 6·0
Fakenham	—10·0	Thirlestane	— 8·7
Long Stratton	—10·0	Braemar	—11·0
Cheadle	—15·0	Castle Newe	—12·0
Rolleston	—10·0	1867.	
Tamworth	— 7·0	Staines	— 7·0
Lichfield	— 6·0	Epsom	—12·0
Appleby (Lincoln)	—11·0	Cobham (Pyports)	— 6·8
Carlton	—12·0	East Peckham	—10·0
Highfield House	— 6·0	Berkhempstead (Hawridge)	— 8·0
Beeston	— 8·3	Ware	— 6·5
Beesthorpe	— 6·0	Datchet	— 8·0
Worksop	— 6·0		

NOTE.—In Number XII., page 104, the temp. at Stratford, in 1816, should have been —5·0, instead of 5·0, and on page 102, Stonyhurst should have been 6·7.

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NOTES MADE DURING THE LONG FROST OF 1813-14.

To the Editor of the Meteorological Magazine.

SIR,—The frost commenced the 26th December, 1813; the thermometer (placed against a house in Cirencester and taken at half-past 8 a.m.) fluctuated between 12° and 22° for the first three weeks; during this period there were two falls of snow of about 2 inches deep. The sky was clear and there was little wind, always from the N. or E. At the beginning of the fourth week there was a great disturbance in the atmosphere, high winds, and a fall of 15 inches of snow with deep drifts, stopping the traffic of the roads; hard frosts followed, the thermometer falling to 10° on the 25th January; the wind then shifted to the S. and day thaws succeeded by frosty nights followed. The wind then went to the N. with clear frosty weather.

On the 3rd February two dense concentric circles appeared round the moon, and on the 5th we had snow, and then a rapid thaw, leaving only drifts of snow. The frost then resumed and continued with keen winds to the end of February; a slight tendency to thaw in the beginning of March was followed by a week of steady, clear, frosty weather until the 12th, about which time crystals of snow fell, then a week of cold, easterly winds with severe frosts until the 20th March, when a S. wind brought mild weather and rain.—Yours,

Further Barton, Cirencester. THOMAS C. BROWN.

GALE ON FEBRUARY 6TH.

SIR,—We had a severe hurricane here on Wednesday morning, February 6th, from the S.W. The wind blew strongly from the early morning, and at 3.16 a.m. attained such force as to knock down the semaphores at the railway station, at the same time doing other severe damage; extreme force 21 lbs.; the wind then calmed down a little, but at 10.45 a.m. it again blew with fearful violence, tearing down a large elm, 45 feet high, on my glebe, and blowing down two barns not very far distant from us. One erected two years ago, a large barn, brick and timber built and 25 feet high, was literally annihilated, the roof blown entirely off, and portions hurled nearly 60 feet away, to the no small astonishment of a laborer who was threshing inside the barn, and who, although much cut with the shower of slates, was providentially saved; extreme force 26·04lb. We have not had such wind since the date of the wreck of the "Royal Charter."

I am, very truly your's,

Turgis Rectory, Strathfield Saye, Winchfield. CHARLES H. GRIFFITH.

February 9th, 1867.

LOW TEMPERATURES.

To the Editor of the Meteorological Magazine.

MY DEAR SIR,—I send you a list of the lowest temperatures in each year from the *end* of 1855 to 1862 at Red Hall, near Leeds, and a single one in 1864 at High Harrowgate, a very similar situation. Up to December, 1860, the thermometers were placed in our back yard, on the north side of a wall, which caused the range to be less, and I afterwards found that when placed on a stand on a large lawn they read not unfrequently 3°, and sometimes 5°, lower on a still night. Yet the yard itself was open enough, being some 50 yards across. I have given a sort of sketch of the weather that just preceded the minimum, to show you what I meant by the letter I wrote a short time ago. If you think the investigation not unnecessary, a few similar extracts from registers might enable you to make some generalisations which would be afterwards verified and confirmed, or rejected. One cannot see much from one register, but a dozen might throw a little light on some points which can hardly be said to be yet settled. At Red Hall it never fell below 18° without a good covering of snow, although some of the "S. E. frosts," (as I call them, being a distinct genus which never indulge in snow till they go away,) have been marked by the lowest day maxima and the clearest possible sky. If you thought it worth while to get some such registers as I have suggested, I should have no objection to give any assistance that might be in my power towards classifying them, &c.—Believe me to remain, yours truly,

60, Hall Gate, Doncaster, *Feb. 4th*, 1867. FENWICK W. STOW.

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Lowest Temperature registered at Red Hall, near Leeds (4 ft. from ground), in each year from December, 1855, to 1862. Soil clay; ground generally level; elevation 450 ft.

Year.	Day.	Min. at 4 ft.	Max. previous day.	Rise + or fall — of Bar. since 9 a.m. previous day.	Dry and wet bulbs at 9 a.m. (On previous day.)	Cloud 0—10. (On previous day.)	Direction of Wind. (On previous day.)	Strength of Wind. (On previous day.)	SNOW. Depth on ground, inches, about	SNOW. Date of falling.	SNOW. Character.	REMARKS.
		°	°	in.	°							
1855	Dec. 22	18·0	24·0			0	S.E.	V.stng. breeze	0	...	...	Wind blew strongly from S.E. throughout the frost.
1856	Dec. 4	18·0*	26·0	+0·14		0	N.	Light.	6 at least.	Nov. 26&30 & Dec 2	?	Minimum *occurred again at noon.*
,,	Dec. 28	17·5*	25·0	+0·20		0	N.W.	Sharp breeze	6	25 & 26	Firm.	
1857	Jan. 30	11·5*	26·0	—0·06		2	N.		4	27 & 28	Light.	
1858	Mar. 8	19·0	37·0	+0·01	29·5 / 29·5	3 or 4	N.W.	Gale.	7	same nigt	?	The min. occurred on a "very stormy night."
,,	Nov. 24	19·0*	35·0	—0·19	29·5 / 28·0	0 ?	W & NW		1	20	?	
1859	Dec. 19	15·0*	24·0	+0·02	21·5 / 20·0	10	S.	Light.	5	15 & 18	Light.	
1860	Dec. 25	11·0*	22·0	—0·30	16·0 / 14·5	0	W. N. W.	Sharp breeze	5	21 & 23	Light.	
1861	Feb. 13	12·0	37 ?	0·00		5	N.N.W.	Strong.	3	12	'Haily'	
1862	Jan. 19	19·0	30·2	—0·06		3	S.E.	V.stng. breeze	0	...	...	A "S.E. frost."
†1864	Jan. 8	14·0	24·0	—0·18		1	N.E.	Light.	v. slight snow.	...	...	Frost began with S.E. wind.
Lowest Temperature at 4 ft. at the Knoll, Ripon; 110 ft. above sea; gravel soil. Situation on first rise from valley of river.												
1865	Jan. 3	14·8	36·0	—0·24	32·4 / 28·4	9	S.S.W.	Strong.	2	2	Light.	
,,	Feb. 15	14·6	37·5	—0·30	33·0 / 32·8	4	N.E.		?	13	Sleety.	
1866	Mar. 1	16·0	38·5	+0·24	29·0 / 29·0	6	N.E.	Strong.	2 or 3	Feb. 28		Violent gusts and snow storm day before.
1867	Jan. 2	2·0	21·8	—0·17	15·2 / 15·1	2 cirrus.	N.	Light breeze	3	Dec. 31	Light.	

* Readings in calm nights marked * would have been lower in a more exposed situation.

† This taken at Harrowgate; clay soil; 420 ft.

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THE SILVER THAW.

To the Editor of the Meteorological Magazine.

MY DEAR SIR,—I must tell you of a strange occurrence here yesterday evening. As I was sitting in my study about 8 p.m., I heard what seemed like the pattering of rain against the window, which faces the S.E. I felt surprised at this, knowing that the temperature outside had been for several days below freezing point, and often considerably so. On careful observance I found that though there was some hail, yet the fall was principally *rain*. The thermometer outside was then about 27° or 28°, and I felt fairly puzzled to think how rain could fall under such circumstances. I fancied that the thermometer must have burst, and so not told a true tale; but on putting out a common boxwood one, it soon fell to 29°. On putting my foot on the ground I heard the newly-frozen rain crunch under it. The rain continued till about 10.30, the thermometer still keeping to about 28°, and after I went to bed at 11.30 I heard the rain again falling on the window, which has the same aspect as that of the study. I had previously remarked that as the rain fell on the windows and ran down the glass it froze there. To see hail in summer is a common occurrence, but I certainly never saw or heard of rain falling when the temperature was 4° or 5° below freezing. To-day there is a decided thaw, as was to be expected after the strange freak of nature last night. I measured ·12 in. of rain at 9 this morning.—Yours truly,

High Roding Rectory, Dunmow, Essex, EDWARD MAXWELL.
23rd January, 1866.

DEAR SIR,—Happening to turn to an old journal of mine, I find the following entry:—"1855. Reedings, Newick, Sussex, February 3rd. Rained heavily from 1.30 to 7 a.m. this morning, each drop freezing where it fell, so that every leaf was covered this morning with a thick coating of ice. Thawed much to day." I also find that frost began on the 16th January, and that it went on again after the thaw on the 3rd February, and that there was 6 inches of snow on the 11th of March. I do not seem to have noticed the weather afterwards.—Yours very faithfully, THOMAS E. CRALLAN.

Framfield Lodge, Hurst Green,
February 23rd, 1867.

SIR,—I note in the February number, your remarks on the silver thaw of January 22nd. In this neighbourhood it began later in the evening, as at half-past 10 p.m. it was snowing a little, but at 6 o'clock the following morning the roads were one mass of ice; the thermometer fell to 19° during the night, at 9 o'clock the following morning it was 31°. The above were registered by Hick's thermometer, on a stand 5 feet above the ground.—I am, Sir, yours respectfully,

Rastrick, *March 9th*, 1867. ALFRED CLAY.

PERIODIC (?) HAIL-BALLS.

To the Editor of the Meteorological Magazine.

SIR,—There fell here to-day, March 6th, a shower from the N.W. of soft hail about 3.45 p.m.; it lasted for a very short time, and was followed by a little snow. I was on the look out for this soft hail, as it was mentioned as periodic (?) in your Magazine for March last year. It was not like ordinary hail: your description of it as miniature snowballs seems to be very close; I could observe no crystallization, the shapes appeared very irregular, but chiefly of a rough cubic form; I saw none that appeared larger than swan shot: this I should put down as the average size of the "hail-balls."

The snow that fell after it was not in a thick shower. If the snow in falling through layers of atmosphere became semi-melted, and then partially frozen again, it would, I fancy, present the above appearance of balls. But these balls were composed of more than one snow-flake bound together, and to effect that, I should imagine a dense shower would be requisite.

It is certainly a very curious fact, that this occurence should so frequently have happened on or about this date, or that of the 8th of March. We have had no snow this month up to to-day. Should any more "soft hail" fall here in the next two or three days, I will acquaint you.—Yours sincerely,

Staff College, Farnboro' Station, ROWLAND HILL FAWCETT.
March 6th, 1867.

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DERIVATION OF THE WORD "ANEROID."

To the Editor of the Meteorological Magazine.

SIR,—Questions of philology are generally troublesome, especially when they concern words concocted in modern times from Greek roots, not always in the most regular way. A modern Greek compound is as puzzling to me as a queer-looking mutton bone, which a dog has just gnawed and buried, is sometimes to an amateur geologist. It is not, therefore, without diffidence that I venture to stand up for the much-derided derivation which you gave.

Whether an aneroid be of an "*inquiring*" disposition or *unamiable*, whether its inside be *very hollow* or *very dry*, or its "shape" be that of a "*vacuum*" and its action that of a *manly automaton*, far be it from me to decide. But without insisting on the inventor's scholarship, I certainly do attach a definite meaning to the name he invented.

It is true that νηρός is somewhat rare, but ναρός, which is only another form, was good enough for Sophocles and Æschylus and even the sea-god Nereus did not disclaim the connection; νηρός then, or ναρός, comes from νάω to flow, and means therefore, not *moist*, but *fluid* or *liquid*. The distinction is important, for the inventor doubtless meant to express by the name "aneroid" the fact that *no fluid* (as water or mercury) was used in its construction, as they are in other barometers. In short, he meant that it belonged to a *class* or *species* (εἶδος) of instruments, which might be called ἀνηρά, because destitute of fluid.—Your obedient servant,

F. W. S.

EARTHQUAKE IN WESTMORELAND.

To the Editor of the Meteorological Magazine.

SIR,—On Saturday morning last, February 23rd, about 1 a.m., the shock of an earthquake was felt here; the wind at the time was westerly and boisterous. The local papers report that it was felt at Ambleside, and other places.—Yours,

Greenside Mines, Ullswater, *March 1st.* J. BARNINGHAM.

A correspondent at Ambleside writes to the *Express* as follows:—

"The inhabitants of the group of valleys extending from the foot of Windermere to the head of Langdale have been looking in vain for some notice in the newspapers of the earthquake which startled them out of their sleep at about a quarter-past one on Saturday morning last; and, rather than let such an event pass altogether without public notice, I now send you an account of as much as is known about it in the neighbourhood from which I write. Friday night was fine—a brillant starlight night, and perfectly calm. At the time I have mentioned, a sound like a prolonged clap of thunder—only too loud and too long-continued for thunder in this country—seemed to fill the valley of the Rothay, while the houses—even those built into the rock—shook as in a hurricane. A dead stillness followed for a considerable time; and then the wind rose. In the morning it appeared that the inhabitants of Ambleside had undergone the usual alarms occasioned by earthquake. Children's cots had been shaken, and the babies awakened; crockery and window sashes had rattled, aged people and invalids had risen from their beds; one lady believed there had been an explosion within her house; the people at the bobbin-mill in the ghyll had dressed and come down the hill; and so forth. The first conjecture was that the powder-mills at Elterwater had blown up; but it was presently known that the inhabitants there, were as wonder-stricken as ourselves. Everybody at Grassmere got up, and the alarm was very great throughout Langdale, and not less at Windermere. How much further it was felt we hope to hear some day. Persons who have experienced earthquakes in volcanic countries declare that there can be no question of the character of this phenomenon, though nobody seems to have heard of any preceding visitation of the sort in this district."

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FEBRUARY, 1867.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Date.	Days on which .01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of nights below 32°.
		inches	inches.	in.							
I.	ENGLAND. Camden Town	1·44	+ ·22	·36	16	11	56·2	15	30	8	1
II.	Staplehurst (Linton Park)	1·53	+ ·02	·28	17	17	56	17	29	3	5
,,	Selborne (The Wakes)	2·54	+ ·83	·48	5	13	50	*16	22	28	5
III.	Hitchen	1·45	+ ·19	·46	6	10	52	†16	25	28	1
,,	Banbury	1·31	— ·12	·33	5	15	53·7	20	31	3	3
,,	Wisbech	1·09	...	·28	8	10	58·1	20	28·2	...	2
IV.	Bury St. Edmunds (Culford)	1·82	+ ·41	·42	5	10	56	16	22	27	5
V.	Calne	1·95	...	·50	7	13	55	‡18	31·8	8	1
,,	Plymouth (Goodamoor)	4·86	+1·50	·86	6	17	55	...	25	...	...
,,	Barnstaple	3·57	+1·49	·80	27	22	...	...	...	...	...
,,	Taunton (Fulland's School)	1·89	+ ·51	·47	6	21	...	...	30	3	1
VI.	Shrewsbury (Highfield)	1·53	+ ·39	·48	8	12	...	...	...	...	...
,,	Tenbury (Orleton)	2·13	+ ·56	·39	5	19	59	20	28·2	28	2
VII.	Leicester (Wigston)	1·28	— ·06	·20	8, 11	11	56	12	24	28	4
,,	West Retford	...	...	..	...	...	...	..	...	...	...
,,	Derby	1·95	+ ·47	·53	7	10	59	19	29	27	3
VIII.	Manchester	2·93	+ ·98	...	...	12	...	...	...	...	...
IX.	York	1·17	— ·21	·35	10	11	53	§10	24	28	2
,,	Skipton (Arncliffe)	7·56	+3·89	1·28	7	18	48	2	22	28	3
X.	North Shields	·82	— ·71	·26	7	12	53	21	26	28	3
,,	Borrowdale (Seathwaite)	17·05	+5·67	2·32	4	21	...	...	...	...	...
XI.	WALES. Abercarn	4·28	...	·88	7	14	52	16	30	28	1
,,	Haverfordwest	5·97	+3·11	1·00	11	18	55	23	27·5	28	...
,,	Rhayader (Cefnfaes)	3·53	+ ·55	·85	8	20	55	...	23	...	...
,,	Llanberis (R. Victoria Hotel)	5·45	...	·87	3	16	...	...	...	...	...
XII.	SCOTLAND. Dumfries	2·10	— ·45	·31	7	19	55	21	23·5	27	3
,,	Hawick (Silverbut Hall)	1·73	...	·40	3	19	...	...	22	25	11
XIV.	Ayr (Auchendrane House)	3·67	+ ·32	·65	3	20	58	1	23	27	3
XV.	Otter House	5·50	+1·58	·70	4, 10	16	51	21	22	27	4
XVI.	Leven (Nookton)	1·62	— ·08	·29	7, 10	14	54	21	25	27	4
,,	Stirling (Deanston)	4·27	+1·27	·65	4	21	52·4	21	21	27	8
,,	Logierait	2 92	...	·58	3	14	...	...	...	...	...
XVII.	Ballater	1·30	...	·21	9	14	55	22	20	28	9
,,	Aberdeen	1·44	...	·47	9	17	54·4	21	28·7	**27	3
XVIII	Inverness (Culloden)	1·81	...	·43	8	10	51·6	22	29·3	28	4
,,	Fort William	9·08	...	·90	1	21	54·5	18	25·5	27	6
,,	Portree	8·78	—1·45	1·26	10	17	51·8	15	26	27	4
,,	Loch Broom	4·74	...	·46	9	21	...	...	...	...	...
XIX.	Helmsdale	3·09	...	·35	25	19	...	...	...	...	...
,,	Sandwick	4·03	+1·55	·41	9	21	...	..	...	...	...
XX.	IRELAND. Cork	2·59	...	·43	5	19	...	...	...	...	...
,,	Waterford	2·93	+ ·90	·47	27	20	...	...	...	...	...
,,	Killaloe	5·21	+2·31	1·03	7	18	55	20	29	3	1
XXI.	Portarlington	2·97	+ ·94	·49	28	23	...	...	...	...	...
,,	Monkstown	2·14	+ ·50	·39	25	19	58·4	1	33	6	0
XXII.	Galway	4·98	...	·64	10	23	...	...	...	..	...
,,	Bunninadden (Doo Castle)	4·42	...	...	...	...	52	‖1	29	17	1
XXIII	Bawnboy (Owendoon)	4·08	...	·70	5	24	...	...	...	...	...
,,	Waringstown	2·02	...	·40	5	17	55·5	21	25	26	6
,,	Strabane (Leckpatrick)	3·27	..	·61	7	17	53	¶19	27	27	8

*And 20th. †And 20th. ‡And 20th. §And 21st. ‖And 9th & 13th. ¶To 22nd. **And 28th.

+ Shows that the fall was above the average; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail.

ENGLAND.

LINTON PARK.—A very mild month; only five slight frosty mornings; often dull and foggy, with hazy R, no heavy downpour. Bar. fluctuated much in the first week, afterwards it was generally high. Winds mostly S.S.W. and W., but opposite changes from these did not always affect either the bar. or the weather. L faintly seen on the 17th. The continuance of mild weather is pushing on vegetation, and the birds are singing as in early spring.

SELBORNE.—Aurora on 8th and 13th. Fog on 1st, 17th, 18th, and 19th. Boisterous winds from 5th to 8th. Prevailing winds S.W. Thrush first heard on 1st. Little S on 26th.

BANBURY.—High winds on 6th, 7th, and 8th. Bar. at 7.30 a.m. on 6th 28·390 at 32°. Hazel blooming in the middle of the month; whitethorn beginning to bud about the 17th. Fog on 18th, 19th, and 20th.

WISBECH.—Bar. 28·728 in. on 6th; gale 15lbs. on square foot. Lunar halo on 14th. Solar halo on 27th. White frosts on 27th and 28th, the coldest days in the month, which, for February, was unusually mild, the mean temp. being 44°·6. Fog on 18th and 19th.

CULFORD.—Altogether a very favourable month, mean temp. being 44°·2. Windy from 5th to 8th. Bar. very low on 6th.

CALNE.—Violent gale on 5th, with R and L in evening. Gale with L on the evening of 8th, after raining all day. Snow all night of 27th, melting as it fell. Daffodil in bloom on 25th, and leaves showing on quickset hedge.

HIGHFIELD, SHREWSBURY.—Bar. on 6th 28·68 in.

ORLETON.—The month generally damp, cloudy, and warm, with frequent falls of R, but not in large quantities. The mean temp. about 5° above the average. On the 26th the wind changed northward, and the following two days were cold, with a slight fall of S on the 28th. Distant T on 5th after 1 p.m., and frequent L on the night of the 8th, in S.W. The Teme and Severn flooded on the 9th and 10th from heavy R in Wales. Gale on 6th, with very low bar. Fog on 18th and 19th.

WIGSTON GRANGE.—The temp. of this month has been unusually high, the mean being 5° higher than the mean of this month for the last 12 years, the mean max. being 50° and the mean min. 37°.

DERBY.—A warm agreeable month, unusually so for February. Vegetation active, but with a N. wind, and bar. at 30·41, a return of frost must be looked for.

ARNCLIFFE.—The early part of the month exceedingly wet. On the 8th the highest flood in the river for many years. The latter part of the month dry and fine.

NORTH SHIELDS.—Aurora on the 8th and 17th. Lunar halo on 13th and 16th. S on 6th. H on 27th. Fog on 9th, 14th, and 15th.

SEATHWAITE.—A month of high temp. and great humidity.

WALES.

ABERCARN.—The early part of the month was rainy and stormy. After the 11th the temp. became milder, and it was generally calm and fine until the 26th, when it became much colder. T S on night of the 8th. Fog on 17th and 18th.

HAVERFORDWEST.—A generally damp and mild month. No high winds, the prevailing characteristics being fog and mist. No frost till the last night.

CEFNFAES.—The weather during the month has been generally open and damp.

SCOTLAND.

DUMFRIES.—The first 11 days were wet and stormy, with S on 6th, 7th, and 11th. From 12th to 25th mild and calm, with little R. On 26th frost set in very severe. Near the close of the month whins were in bloom, the honeysuckle in leaf, and buds bursting on hedgerows and fruit trees.

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SILVERBUT HALL, HAWICK.—February, 1867, will long be remembered for its mildness. Heavy S showers on the 10th, but no frost of any consequence till the 23rd, when the ther. registered 24°, and 22° on the 24th. Gardening and husbandry operations are in a pretty forward state, but the buds of many of the trees are suffering for their incautiousness in expanding so freely at the beginning of the month.

AUCHENDRANE.—February has been a month of fine weather for all seasonable out-door work and rural sports.

OTTER HOUSE.—A comparatively mild month. Rainy till the 13th, then seven days of dry weather, afterwards light rain to the end of the month. T and L on 2nd, aurora on 9th.

NOOKTON.—S showers on the 8th. Gales on 1st and 25th, and frequent high winds during the month. 26th, 27th, and 28th fine, but cold.

DEANSTON.—2 in. of S on 6th. S.W. gale on 2nd.

LOGIERAIT.—The finest February on record. No S throughout the month. Keen frost on the last three nights. Spring work advancing rapidly.

BALLATER.—A fine month throughout, particularly from the 11th to the close. Vegetation was advancing very rapidly, but received a severe check in the last three days, the temp. falling to 29°, 22°, and 20°. The lark and other birds were singing on the 20th. The R fall is 1·07 below the average of the last 5 years, although in 1863 only 0·51 was measured. It also was a remarkably fine month, and gardening operations were commenced on the 18th, the same day as this season. Lunar halo on 21st. L in E. on 2nd.

ABERDEEN.—Auroræ on 4th, 5th, 8th, 12th, and 13th. L H on 9th and 21st. S on 8 days, but would not amount to 2 in. altogether. Bar. on 6th 28·34 in. but no gale here; the month was remarkable for high mean temp. dryness, great range of bar., and rather light winds from S., S.W., and W., more frequently than usual.

CULLODEN.—L on 2nd and 3rd. S or sleet on 10 days; high wind on 10th and 24th; frequent night showers.

ROSSE PARSONAGE, FORT WILLIAM.—With the exception of two mild days (the 9th and 15th) February was wet and boisterous up to the 25th; after then it was clear and frosty. No snow except a very little on the 6th. Strong wind from S.W. on 1st, 2nd, 3rd, 9th, and 24th.

LOCHBROOM.—This month has certainly commenced with an adder's head, and I may say has ended with a scorpion's tail, for its extremes were as rough, stormy, and disagreeable as can well be conceived, while its centre, from the 13th to the 21st, was as beautiful for the season as could well be imagined. It has one peculiarity—while many of its days were passable, the nights broke out in the most terrific manner, but its last day being very fine, it is to be hoped that the seed-time will be favorable. T S on 10th.

SANDWICK.—February has been wetter and milder than the average. L on the 1st, T S on 2nd, T on 22nd and 24th, gales on 2nd and 3rd, blowing 966 miles in 24 hours; from 6th to 7th blowing 50 miles per hour; and one on 24th and 25th, blowing 60 miles per hour. Aurora on three nights.

IRELAND.

MONKSTOWN.—At noon on the 6th, a severe T S with the exception of one or two days, the temp. was pretty uniform, until the 26th, when it became colder, and the mountains were again covered with snow, some of the higher ones appearing to be thickly coated. Bar. varied considerably during the month; max. 30·466 in. on 23rd, while on the 6th it was only 28·738 in.; a fall of 0·834 took place on the 3rd, but was not (at least here) attended by such severe consequences as might have been anticipated from so rapid a fall.

DOO CASTLE.—Very wet month; ground completely saturated, and little progress has been made in farming operations. A fierce storm on the night of the 9th.

OWENDOON.—Wet for the first 11 days, then fine to the 25th.

WARINGSTOWN.—The early part of the month wet and unfavorable for labor, but the last fortnight was fine, dry, and seasonable. The spring is more forward than the late severe weather would have led one to expect.

LECKPATRICK.—Warmest February since 1863, in which the mean temp. was nearly the same. Vegetation very forward, and prospect of good early seed-time.

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RAINFALL AT CASTLETON MOOR, MANCHESTER.

Lat. 53° 35′ 20″ N. Long. 2° 10′ 31″ W. 475 ft. above Mean Sea Level.
FOR THE YEAR 1866.

Height above ground	1 foot.		5 feet.		10 feet.*		20 feet.	
Diameter	5 in.	8 in.	5 in.	8 in.	5 in.	8 in.	5 in.	8 in.
	in.	in	in	in.	in.	in.	in.	in.
January.....	5·017	5·154	4·765	4·937	5·032	4·607	4·323	4·452
February	4·839	4·847	4·643	4·731	4·820	4·448	4·349	4·400
March	2·103	2·064	1·791	1·785	1·770	1·688	1·570	1·615
April	1·077	1·047	1·023	·954	1·008	·956	·929	·955
May	1·973	1·926	1·875	1·855	1·907	1·824	1·778	1·782
June	5·938	5·815	5·702	5·570	5·715	5·579	5·424	5·561
July	3·961	3·890	3·919	3·872	3·874	3·839	3·810	3·840
August	5·242	5·109	4·949	4·898	4·954	4·865	4·648	4·767
September.....	8·598	8·575	8·193	8·406	8·421	8·076	7·723	7·854
October.....	3·128	3·061	2·892	2·960	2·992	2·903	2·666	2·777
November.....	6·832	6·781	6·384	6·554	6·553	6·395	6·014	5·990
December	5·592	5·521	5·240	5·351	5·539	5 103	4·813	4·842
Totals	54·300	53·790	51·376	51·873	52·585	50·283	48·047	48·835

J. CHADWICK BATES.

We are sure our readers will learn with regret that the non-arrival of the tables epitomized above was caused by serious and fatal illness in Mr. Bates's family. The returns for the last year harmonize perfectly with the results of previous years, as shown in the following abstract from *British Rainfall*, 1866, page 26, the values for 1866 being now added.

Relative Rainfall at different heights, as deduced from Castleton Observations.

Gauges 8 inches diameter.				*Gauges 5 inches diameter.*			
Height.	1864.	1865.	1866.	Height.	1864.	1865.	1866.
1 foot.....	1·00	1·00	1·00	1 foot.....	1·00	1·00	1·00
5 feet.....	·97	·95	·96	5 feet	·95	·93	·95
20 feet	·90	·90	·91	20 feet	·90	·87	·89

These observations also enable us further to examine the relative indications of gauges 5 inches and 8 inches in diameter. Completing the table on page 29 of *British Rainfall*, 1866, we have the following results :—

Year.	1 ft. above ground.		5 ft. above ground.		20 ft. above ground.	
	5 inch.	8 inch.	5 inch.	8 inch.	5 inch	8 inch.
1864.	1·00	1·01	1·00	1·03	1·00	1·01
1865.	1·00	1·00	1·00	1·02	1·00	1·03
1866.	1·00	·99	1·00	1·01	1·00	1·02
Mean..	1·00	1·00	1·00	1·02	1·00	1·02

It is almost needless to point out that the observations during 1866 confirm in almost every respect the inferences and deductions from those of the preceding years, thus proving at once the accuracy of the observations, and the reliability of the deductions.

* From some cause (at present unknown) this gauge has evidently collected about 5 per cent. too much.

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SUPPLEMENTARY LIST OF RETURNS OF RAINFALL IN 1866.

Division.	COUNTY.	STATION.	OBSERVER.	Rain Gauge. Diameter.	Height above grnd.	Height above sea l.	Depth of Rain 1866.	Days on which 01 or more fell.
				in.	ft. in.	feet.	inches	
II.	Surrey.....	Kingston (Fairfield)	Mr. T. Chalk	5	0 6	...	23·87	...
,,	,,	Cobham Lodge	Miss Molesworth..	5	0 6	100	26·80	...
,,	Kent	Staplehurst (East Sutton)	Mr. T. Skinner ...	8	0 8	...	32·93	165
,,	Sussex.....	Lynch [Midhurst]	J. Eames, Esq. ...	5	0 6	160 ?	43·85	...
IV.	Norfolk ...	Yarmouth, Filby	Mr. Crisp	5	2 4	18	27·69	...
,,	,,	East Dereham.....	G. H. Cooper, Esq.	8	3 0	...	30·39	...
V.	Devon	Exeter (Brampford Speke)	W.H.Gamlen, Esq.	8	...	...	37·22	...
VI.	Gloucester..	Bristol (Brislington)	G. Thomas, Esq ...	18	5 3	...	38·13	...
,,	,,	Stroud	J. Bateman, Esq. .	..	1 0	240	35·43	218
,,	Stafford ...	Wolverham't'n (Patshull)	Rev. B. S. Malden	8	1 6	400 ?	23·94	...
,,	,,	Stoke-on-Trent (Stanley).	J. S. Forbes, Esq.	5	3 1	550	34·10	178
,,	,,	,, ,, ,, (Etruria).	,, ,, ,,	5	4 2	440	36·17	208
,,	,,	Leek (Rudyard)	,, ,, ,,	5	12 7	500	37·86	177
,,	,,	Knypersley [Congleton]...	,, ,, ,,	5	14 0	500	32·01	201
,,	,,	Wincle [Macclesfield].....	,, ,, ,,	5	5 0	500	39·18	176
,,	Worcester..	Worcester (Gas Works)...	N. Gosling, Esq...	10	4 1	...	25·87	150
VII.	Leicester ..	Thornton Reservoir	J. Bevins, Esq.	...	2 8	420 ?	27·65	...
,,	,,	Loughboro' (Cedar Cot.)	J. Gills, Esq.	5	0 9	400	32·22	...
,,	Lincoln ...	Brigg (Ferriby Sluice) ...	Rev. J. E. Cross...	...	0 9	20	25·53	...
,,	Derby	Morley.....	Rev. S. Fox	5	3 0	406	33·25	...
VIII.	Lancashire.	Cartmel (Allithwaite) ...	W. R. Nash, Esq.	...	1 0	88	46·95	195
IX.	Yorkshire..	Outershaw	*Preston Guardian*..	..	...	..	91·73	...
,,	,,	Mirfield (Calder Farm)...	Mr. J. Johnson ...	8	0 5	320	34·07	...
,,	,,	Redcar (Upleatham)	M. Gray, Esq. ...	3	0 4	330	28·00	...
XI.	Monmouth.	Abergavenny	Dr. McCullough...	5	1 3	...	38·61	210

NOTES ON BRITISH RAINFALL, 1866.

DIAGRAM.—It has been suggested that Bideford is placed too high in the list, where it stands as 56, the depth returned from Buckish. Northam is said to be the true representative of Bideford, and it only returned 41 inches—less than any station on the west of Devon or Cornwall.

On page 85 Clapham is entered as having 177 days with rain; it should have been 187.

On page 104, for "Festiniog (Blaenyddob)," read "Blaenyddol."

On page 116, for "Howard, N. T., Esq.," read "Howard, W. D., Esq."

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

XV. APRIL, 1867. [PRICE FOURPENCE, or 5s. per ann. post free

THE MEASUREMENT OF SNOW.

THE frequency of snow showers during the past month, has again called into prominence the best method of measuring it. In *British Rainfall*, 1864, page 12, the following rules were given :—

"In snow, three methods may be adopted; it is well to try them all. (1) Melt what is caught in the funnel, and measure that as rain. (2.) Select a place where the snow has not drifted, invert the funnel and turning it round, lift and melt what is enclosed. (3) Measure with a rule the average depth of snow, and take a twelfth as the equivalent of water. (Comparative observations of this class will be very acceptable.)"

In the *Rainfall Circular*, for March, 1865, reprinted on page vii. of the Appendix to *British Rainfall*, 1865, Mr. Harrison, of Weybridge Heath, asked for the results of any direct experiments in confirmation, or otherwise, of the third rule given above. All the observations available were, therefore, thrown into a table. With one exceptional case of 35 inches, almost every equivalent was obtained from 25 to 1, down to 5 to 1, the mean result being 14 inches of snow = 1 inch of rain, the conclusion adopted being that less than 12 to 1 should not be taken. Subsequently several communications were received, suggesting that 12 to 1 was too high, but not containing observations in support thereof. Adverting to these and other remarks, the following suggestions were offered :—

"A second point is, to take the snow fairly *as it falls*, not to fill a vessel with the snow; obviously by so doing the snow is rendered more dense. The proper plan, I presume, is—previous to snow, lay down a piece of tin or board in an open place; after the fall, measure its vertical depth in two or three parts of the board; then invert the funnel of the rain gauge on the board, taking care to hold it horizontal, press it down firmly till it touches the board, brush away the snow from the rest of the board, turn over funnel and board together, and, leaving the funnel covered by the board, place the funnel in its bottle, or other similar receptacle, and in a moderately warm room."

Some additional observations from different parts of the country in 1865 gave a mean 11·5 inches of snow equals 1 of rain. The following letters also seem to indicate about the same value :—

SIR,—I am fairly snowed up here, with an average of about 12½ in. deep of snow, so have amused myself by comparing the depth of snow with the rainfall. As the results may be interesting, I send them to you, leaving it to you to make any use of them you please. First as to the gauges—

Casella's 5 in., after the snow in it was melted, measured	·155 inch.
Glashier's 8 inch ditto	·82 "
The average depth of snow round the gauge, I calculate would make the fall	·97 "

From the above I expect you will get some rather serious discrepancies in the

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January rainfall. Next as to the depth of snow compared with the rain. On this five experiments were carefully made, the snow taken from different places—

11¼	inches of	snow gave	·97 of rain.
12	,,	,,	1·12 ,,
7½	,,	,,	·78 ,,
7½	,,	,,	·71 ,,
10	,,	,,	1·17 ,,

These vary for 100 inches of snow from 8·25 to 11·7 of rain. The mean of the five experiments, 9·74 per cent.—I am, dear Sir, yours truly,

Pyports, Cobham, Surrey, GEO. DINES.
January 2nd, 1867.

P.S. Since writing the above, I have tried 8 other pieces of snow, equal to 68 inches deep. This gave 5·82 inches, or 8·55 inches of water for 100 inches of snow, so that altogether 1 of rain for 11 of snow appears to be about the average.

SIR,—The phenomena of to-day have suggested to me some observations as to the measurement of snow, referred to in your *British Rainfall* 1865.

In the important snowfall we had on 10th January, 1866, I have registered the amount ascertained by actual liquefaction, which I quite see is subject to error, not only from the possibility of the funnel not retaining the whole of the snow, but also from evaporation during liquefaction. Still I cannot feel satisfied with the equivalents suggested, viz. "1 to 12," or "1 to 5·4;" neither can I quite agree with you in your remark that in ascertaining the quantity of rain by measurement of depth of snowfall, "the ratio depends entirely on the density." An illustration of this has occurred to-day; I have on two or three occasions this day measured the depth of snow immediately adjacent to three selected spots. The diminution of depth I hardly think can be accounted for either by evaporation, increased density, or superincumbent pressure, or by these forces combined.

Notwithstanding that the thermometer has continued considerably below freezing point ever since the snow fell, and that the ground was hard when it commenced falling, yet, at the bottom of the snow, the surface of the earth is now soft from the radiation of caloric from a greater depth, and *moist*. Whence does this moisture arise? I infer that it is occasioned from the gradual liquefaction of the *under* surface of the snow, which from being incalculable must necessarily derange estimates formed by measurement of snowfall.—I am, dear Sir, yours truly, WALTER F. MOATES.

The Pines, Epsom, *2nd January*, 1867.

SIR,—In order to ascertain how much water a given quantity of snow yielded, when melted, I made six experiments. I filled a cubic inch measure (made of brass, and which contains one cubic inch of distilled water at 60°) *with newly-fallen snow*, and allowed it to melt at the temperature of the room, 57°. The result of *five* of these trials was, that 1 cub. in of snow = $\frac{1}{12}$ *of water*, the sixth trial gave 1 cub. in snow = $\frac{1}{8}$ *of water*. The result of five experiments, therefore, corroborates your rule given, page vii. *Rainfall Circular*. In these experiments the snow was taken from a different place for every experiment, and carefully put into the measure.—I am, truly yours, JAMES PROCTOR.

Barry Village, Forfar, N.B., *26th January*, 1867.

The results are therefore—

Table published in 1865.....	14	inches of	snow =	1 of rain.
Observations made in 1866 ...	11½	,,	,, =	1 ,,
,, ,, 1867 ...	11½	,,	,, =	1 ,,
Mean	12·33	,,	,, =	1 ,,

These values, however, agree *too well*; for instance, the snow which fell on January 10th and 11th, 1866, was so dense that 4 inches of it gave 1 inch of rain. (*Approximately*, we have no really good determination.) A few such observations would, of course, materially alter the equivalent.

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It is hardly the time of year to ask for additional determinations of the relative yield of freshly fallen snow, but we trust observers will remember when winter returns that there is very much to be done in the matter.

THE ECLIPSE ON MARCH 6TH, 1867.

ALTHOUGH the late eclipse was not in England of great magnitude, it was sufficiently so to be worthy of notice. As a preliminary we may quote the depression of temperature on some former occasions.

Year	Date.	Place.	Shade.	Black Bulb.	Year	Date.	Place.	Shade.	Black Bulb.
1764	April 1 ...	London	1°·0	...	1860	July 18..	London ...	7°·0	30°
1816	Nov. 19...	,, ...	1·0	...	,,	,, ,,	Oundle ...	6·0	...
1820	Sept. 7 ...	,, ...	6·0	...	,,	,, ,,	Dorset	3·0	22
1836	May 15 ...	Cambridge ...	2·5	29°	,,	,, ,,	Silloth	2·8	10
1842	July 8 ...	Gloucester ...	3·0	...	1863	May 17..	London ...	1·0	7
,,	,, ,, ...	London	1·5	...	1867	March 6.	,, ...	1·5	13
1858	March 15.	,, ...	5·0	...	,,	,, ,,	Leicester...	1·0	...
,,	,, ,,	Oundle	4·0	12	,,	,, ,,	Liverpool..	1·0	17

It would be very interesting to examine the many existing records (of which the above are not a hundredth), and by collating them, eliminating as far as possible fluctuations not due to the eclipses, but to ordinary atmospheric changes, and moreover in every instance allowing for diurnal range of temperature, and then classifying the records according to the number of solar digits eclipsed. Thus the existing materials might be made to tell their own tale, and one, if we mistake not, of high interest to all.

Explanatory of the following table, we may mention that the 20 ft. thermometers are in an ordinary stand, elevated on a pole 20 ft. high.

Thermometrical Readings at Camden Town, March 6th, 1867.

Eclipse began, 8.17 ; middle, 9.32 ; ended, 10.52. Magnitude (Sun, =1·0.), 0·7.

Above ground.	4 feet.				20 feet.		4 feet.	20 feet.
	In Shade.		In Sun.		In Shade.		Humidity.	Humidity.
TIME.	Dry Bulb.	Wet Bulb.	Black Glass Bulb	Black Bulb in vacuo.	Dry Bulb.	Wet Bulb.		
A.M.	in.	in.	in.	in.	in.	in.		
8·0	35·0	32·8	...	...	34·8	32·4	79	77
8·15	35·4	33·4	37·0	39·0	35·4	33·2	81	79
8·30	36·1	34·1	37·8	40·2	35·8	33·5	82	79
8·45	36·8	34·7	38·2	43·5	36·4	34·1	83	80
9·0	36·5	34·5	37·3	40·6	36·3	34·0	83	80
9·15	36·3	34·6	37·0	39·4	36·0	34·0	85	82
9·30	36·2	34·5	37·0	37·7	36·0	34·0	85	82
9·45	36·3	34·6	37·0	38·0	36·0	34·0	85	82
10·0	36·5	34·7	37·1	38·4	36·2	34·2	85	83
10·15	36·8	35·0	37·8	39·5	36·4	34·3	85	82
10·30	37·0	35·2	38·0	40·3	36·5	34·6	85	84
10·45	37·1	35·4	38·0	41·0	36·5	34·7	86	85
11·0	38·6	36·8	40·8	55·4	37·5	35·6	86	84

10.16 began to snow. 11.0 sun and snow.

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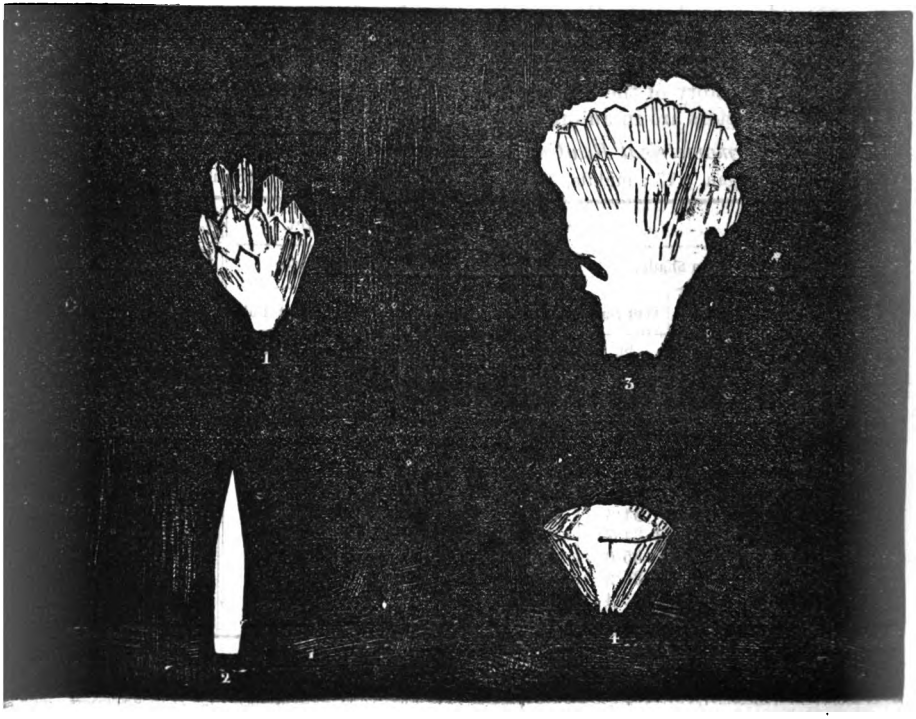
PERIODIC (?) HAIL-BALLS ON MARCH 8TH.

Snow and hail have been so strongly the predominant feature of this month, that the query must remain attached to the above heading for another year. Although in London we had several showers of the soft hail-balls previously referred to*, they were diminutive specimens, very slightly larger than ordinary sleet. The largest that we saw were less than a quarter of an inch in diameter. Although, therefore, they were of the same form as in previous years, and fell on the same day, they fell also on other days, and were in no respect remarkable.

For the convenience of future recognition, we give engravings of the balls which fell in 1857, from a photograph by Mr. Glaisher, (figures 1 and 3); also (fig. 4) those of 1817, copied from Luke Howard's "Climate of London;" and a single spike, reduced (fig. 2) from Mr. Rowell's sketches of hailstones picked up after the Calne hurricane in 1859. Without running into desultory comments, we may point out that the angles in each case closely approach 60°, *i.e.* that of the ordinary crystallization of water; secondly, that even the small balls of the present year generally broke at that angle; lastly, that Mr. Rowell's outline is quoted, in case it may be considered to throw light on how the balls are built up.

* *Met. Mag.*, Vol. I. p. 17—18.



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To the Editor of the Meteorological Magazine.

SIR,—On the 6th inst. at about 4—5 p.m., a slight shower of soft hail fell here, only lasting a few minutes, the balls were about ¼ in. in diameter.

I remain, yours truly, A. M. BOX.

Woodland Mount, Nortonthorpe, near Huddersfield.
March 12th, 1866.

SIR,—Since my last communication on the 6th, I have been carefully watching for any further fall of "soft hail," but none has fallen here except on the afternoon of the 7th, on which I made the following note :—

March 7th, at 1 p.m. a fall of "soft hail" or "miniature snowballs" occurred of much less duration than yesterday's fall ; the "balls," too, were smaller and by no means so compact as those of the 6th. They gave me, and one or two others whose attention I called to it, the idea of one or two snowflakes bound together to form miniature snowballs. The wet and dry bulb were both at 33° F. ; at about 2.30 a dense fall of ordinary snow took place, which lasted for some little time.—I remain, yours sincerely, ROWLAND HILL FAWCETT.

Staff College, Farnboro' Station, *March 12th*, 1867.

SIR,—On the evening of the 11th inst. we had a fall of large half-liquid flakes of snow, much resembling the "natural snowballs" noticed by you in former years. The quantity in my gauge on the morning of the 12th was 0·49 in. On the 8th itself, no snow or rain fell here, but on the evening of the 9th, and through the night there was rain to the quantity of 0·44 in. The rain did not begin till dark, and I did not go out afterwards, but from the sound on the roof of a conservatory, I should think it very likely to have been something more solid than rain,—Yours truly,

Trowbridge, *March 14th*, 1867. W. J. MANN.

P.S.—In 1866 we had no snow or rain on the 6th, 7th, 8th, 9th, or 10th of March.

SIR,—On the 6th, 7th, and 8th, I watched for the periodic (?) snow balls with some interest, and send you the following notes from my journal :—

March 6th.—Cloudless till the end of the eclipse—11.20 a.m. : small half-melted flakes of snow fell—12 : small balls or pellets fell, and some few crystals. This continued till 4 p.m., but very few balls fell after 12.10 p.m.—9 p.m. to 11 p.m. : snow flakes at intervals.

March 7th.—6 a.m. to 10 a.m. : snow falling fast in flakes, which fall to pieces when received upon the arm ; these pieces were found to be 5 and 6 rayed crystals —12 to 3 p.m. : snow fell heavily—3.10 p.m. : snow balls ½ size of pea, fell in a heavy shower, and were followed by a storm of dense flakes till 6 p.m.—9 p.m. : snow flakes falling fast, composed of small crystals.

March 8th—9 a.m. : crystals fell—12 : crystals and balls—3.35 p.m. : crystals and grains—4 p.m. : ditto—5 p.m. : ditto,—I am, Sir, your obedient servant,

King Cross, Halifax, JOSEPH GLEDHILL, F.G.S., F.M.S.
March 19th, 1867.

P.S.—Snow balls also fell at 10.30 a.m. on 12th, and at 6 p.m. on 17th.

RADIATION TEMPERATURES.

To the Editor of the Meteorological Magazine.

SIR,—On the mornings of Feb. 26th & 28th, I noticed what I do not remember having seen before at this time of the year, that the min. temp *on the grass* for the previous 24 hours had not been so low *as at the height of the 4 feet*—*e. g.* :—

26th	At 4 feet—Min. temp.		39°·75.	
,,	On Grass— ,,	,,	41°·00.	Excess 1·25.
28th	At 4 feet— ,,	,,	36°·00.	
,,	On Grass— ,,	,,	38°·00.	Excess 2·00.

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Probably you, or some of your readers could explain the cause of this.

I observe in the last No. of the *Meteorological Magazine* that the min. temp. at some places, is entered as having occurred on the 4th, and others on the 5th; these may possibly be meant for the same time, but some observers may enter it to the day on which they register it, and others to the one previous. Would it not be well in this case, as with the rainfall, to count up to 9 a.m. on each day as belonging to the previous one?

ARTHUR PIM.

[We can hardly reply to the first question more appropriately than by the following extract from "Observations in Meteorology," by the Rev. Leonard Jenyns, M.A. :—

"But there is a phenomenon relating to terrestrial radiation at night, occurring in certain states of the weather, which is still more remarkable; and that is, that occasionally the radiating thermometer, instead of merely rising under the influence of a cloudy sky to the temperature of the air, will be found *higher* than that temperature. This anomalous circumstance, as at first it appears, seems to be the effect of the sudden increase of temperature in the night beyond what prevailed the day previous; such as not unfrequently takes place in winter, on the change from frost to thaw, as also in spring and autumn, but never that I noticed in summer, the nights being hardly ever hotter than the days at that season. This increase of temperature is due to the wind shifting from some point more or less northerly to W. or S.W., and bringing up, not only currents of warmer air, often at a greater elevation than those nearest the earth, but *clouds charged with warm vapours*, which radiate their heat downwards, and thus cause a rise in the radiating thermometer. The rise of the thermometer which marks the temperature of the air is more gradual, the air being only mediately affected through conduction from the earth, with which it is in contact. The following instances in which this occurrence took place are extracted from my Meteorological Register :—

"1848, February 5th.—Radiating ther. last night 3° higher than the other. Mild and generally clouded throughout yesterday: temp. at 10 p.m. 48°; at 10 a.m. this morning risen to 53°·5.

"1848, February 9th.—Radiating ther. last night 1°·5 higher than the other. Yesterday mild, and fine till towards evening; wind then veering to S.W., bringing up clouds and rain. Temp. at 10 p.m. 46°; at 10 a.m. this morning risen to 49°.

"1848, October 3rd.—Radiating ther. last night 4° higher than the other. Mild and fine yesterday, but clouding over in P.M., with rain at night. Temp. at 10 p.m. 57°; at 10 a.m. this morning risen to 60°·5.

"1849, January 19th.—Radiating ther. last night 1° higher than the other. Very fine and mild both yesterday and to-day, but the temp. of to-day rather higher. Ther. at 10 p.m. 49°; this morning at 10 a.m. 50°.

"1849, February 2nd.—Radiating ther. last night 3° higher than the other. Fine and frosty yesterday morning, with the wind N.W.; towards evening wind shifting to S.W., sky at the same time becoming thick and misty, followed by rain. Ther. at 10 p.m. 39°; at 10 this morning risen to 44°·5. Much milder all day than yesterday.

"1849, March 1st.—Radiating ther. last night 1° higher than the other. Weather yesterday very stormy, with rain and snow in P.M. Temp. at 10 p.m. 31°·5; at 10 this morning risen to 38°·5.

"It will be seen that in all the above cases the weather the next morning was warmer than on the evening previous, the increase of temperature amounting in the last instance to 7°, though this was not the one in which the difference between the two thermometers was greatest. Mr. Glaisher, in like manner, found that during cloudy nights a ther. with the bulb placed in the focus of a metallic parabolic reflector, fully exposed to the sky, was frequently higher than a ther. 4 ft. from the ground, and protected from the effect of radiation.—*Phil. Trans.*, 1847, p. 193."

With respect to the second query we must give an emphatic negative. The cases of rain and temperature are not strictly parallel, the former falls pretty equally at all hours, (at least so far as we know at present), the latter has regular hours of maximum and minimum, the minimum with which we are at present concerned, occurs probably 19 times out of 20, at or about the time of sunrise, therefore obviously the minimum read at 9 a.m. is the minimum of *that day*, while the maximum if then read belongs to the day before.]

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WIND AT LINTON PARK, STAPLEHURST, KENT.

Number of Days on which the Wind was in the direction given below, the record being taken at noon each day.

	Wind and No. of Days.								Not ascertained.	Rain.		Frosty Days.
	E.	S.E.	S.	S.W.	W.	N.W	N.	N.E.		Total Quantity.	No. of Days	
										inches.		
1850	17	36	21	60	76	38	40	74	3			
1851	14	28	29	53	47	55	59	76	4			
1852	36	32	46	93	40	22	25	69	3			
1853	34	27	25	76	59	36	36	68	4			112
1854	32	17	29	100	62	41	36	47	1			122
1855	21	32	23	63	36	48	25	115	2	20·84	160	114
1856	14	44	34	99	29	42	28	72	4	27·79	169	89
1857	14	47	37	81	37	38	21	86	4	24·33	137	
1858	16	71	16	73	24	58	19	87	1	16·33	116	93
1859	8	53	21	125	11	59	9	78	1	29·55	151	93
1860	13	27	64	88	29	49	42	54		33·66	216	93
1861	12	28	66	110	34	21	45	47	2	24·01	158	85
1862	8	24	77	95	33	18	73	37		26·93	195	67
1863	12	31	82	118	29	25	36	31	1	22·75	169	64
1864	30	40	65	66	26	28	35	71	5	21·25	156	96
1865	28	45	59	74	36	29	35	55	4	35·18	172	80
1866	16	32	54	89	71	31	35	31	6	30·82	179	66
Average	19	36	44	86	40	38	35	65	2½			90

From the above table it will be seen that the prevailing winds last year were S., S.W., and W., these three points counting 214 days, and the W. and S. much above the average; it is possibly to this cause that the small number of frosty days is due, and in like manner the increased rainfall may be traced, as most of the rains we have are from that direction; occasionally, however, we have a down fall from an opposite direction, and when it is so, it is unusually heavy; our highest winds are generally from S.W., but the one doing the most damage the past year was from S.E., on 11th February; the driest wind we have is E. but they are few compared with those from N.E., which are usually dry also, but less parching to vegetation than due E.; a steady N.E. wind is usually a dry period, and the barometer keeps high; perhaps, however, the highest point this instrument attains is in a fog, when no trace of wind is perceptible, so that no positive rule can be laid down whereby we can judge of the future. Sudden changes of wind often bring rain, but not always so; for the longest dry period we had the past year without any rain was in the middle of July, when there were 20 days without rain, and during that time the wind was in all directions, and never more than two days in one. It is needless to say the N. and N.W. winds are the coldest, the E. and N.E. the driest, and that warmth and moisture usually proceed from the opposite quarters. I may observe, however, that there have been fewer high winds the past autumn than usual, and, as will be seen elsewhere, these months have been dry ones.

JOHN ROBSON.

Sunshine and Showers: their Influence throughout Creation. A Compendium of Popular Meteorology. By Andrew Steinmetz. Reeve and Co., xvi., 432 pages, Cloth 8vo.

Taken as a whole, the most pleasantly written, chatty book on Meteorology which has appeared,—a work, moreover, which will probably augment the yearly increasing number of persons who are patiently

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chronicling their barometers and thermometers, in the hopes that some good must ultimately come of it, although perhaps at present, they feel the lack of a master-mind at the helm, to teach them and guide them aright. When this Newton of Meteorology is to arise, we know not; Mr. Steinmetz neither takes, nor aims at, any such position. He says:—

"My object has been to make the book entertaining as well as instructive; and it will be found replete with practical suggestions which may be useful to all classes of readers, whilst the leading topic—the curiosities of the weather, and weather wisdom—is, I trust, explained with a fullness never before attempted."

This object has been fully attained, so far as we are able to judge—we say so far, because, all through the volume, proverbs and rules for judging the future, keep cropping up, and upon the reliability of these, we can express no opinion. Here is a group which will serve as a type of the whole.

"In low-lying lands, but with a good sunny aspect, a cold and windy May is a good prospect for the harvest; hence the special proverb:—

A cold May and windy
Makes a full barn and findy.

"Much wet in May is worse than excessive drought; hence the proverb:—

A May flood,
Never did good.

"If the last eight days of February, and the first twenty days of March are for the most part rainy, then the spring and summer quarters will be so too. It is said that a great drought always enters at that season."

There are many useful hints as to the management and indications of several instruments, and two new ones are suggested and described, one of these, called a "vaporimeter," seems by far the most convenient instrument yet introduced for measuring the amount of evaporation. We hope on a future occasion to notice it at length.

Almost the only faults in the work are evident oversights, but a trivial one jars if repeated, and Kaemtz (who, rightly enough, is constantly quoted) is after the first few pages, always spelled Kaemst; Connel is Coumel; Kew Observatory is Royal Kew Observatory; Buys Ballot is Buys Biot; and here and there something is omitted or stated twice over. But these are small errors, and do not materially detract from the unquestionable merits of the book.

Concerning the decrease of rainfall, noticed in certain districts, Mr. Steinmetz eloquently adopts the theory of Becquerel and G. P. Marsh as to the influence of clearing large forests.

"Rain clouds are attracted to certain localities more than others, and probably nature's conductors are the points of the leaves of all vegetation, particularly trees; and hence, to the cutting down of trees, we may trace their ultimate sterility—such as the present sterility of the once fertile, but now deserted and desolate, regions of Syria, Barbary, and Chaldæa. The Euphrates often menaced ancient Babylon with inundation, but at present, thanks to the clearance of the woods from the mountains of Armenia, the river is modestly confined to its banks. The ancient river Scamander, which was navigable at the commencement of the Christian era, has completely disappeared with the cedars of Mount Ida, where it took its rise. If trees do not prevent the drought of countries, their roots open the soil for the percolation of water, and they oppose the scattering of the sands of the seashore upon the plains, another cause of infertility.

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MARCH, 1867.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Date.	Days on which .01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of nights below 32°.
			inches	inches.	in.							
I.	ENGLAND.	Camden Town	2·48	+ ·40	·48	9	21	57·1	24	25	17	17
II.		Staplehurst (Linton Park)	3·42	+ ·93	·62	10	23	62	24	21	8	23
„		Selborne (The Wakes)	3·10	+ ·50	·68	13	17	53	31	20	††16	25
III.		Hitchen	2·46	+ ·29	·44	19	16	56	26	17	16	20
„		Banbury	3·17	+ ·97	·72	23	19	54	26	21	17	22
„		Wisbech	1·54	...	·39	19	14	59·6	27	24	16	12
IV.		Bury St. Edmunds (Culford)	1·47	— ·73	·35	9	13	57	‡24	17	16	16
V.		Calne	3·11	...	·76	23	...	62·5	26	21	16	17
„		Plymouth (Goodamoor)	...	...	...	...	...	...	...	...	...	...
„		Barnstaple	3·21	+ ·06	·76	12	19	...	...	...	...	...
„		Taunton (Fulland's School)	3·81	+1·35	·56	23	17	...	...	25·5	‡‡1	18
VI.		Shrewsbury (Highfield)	2·70	+ ·56	·42	23	22	...	...	16·5	21	...
„		Tenbury (Orleton)	3·84	+1·42	·67	23	22	56	24	17·7	16	17
VII.		Leicester (Wigston)	2·88	+ ·77	·81	23	16	59	27	18	16	19
„		West Retford	...	...	..	...	...	...	...	...	...	...
„		Derby	2·09	— ·16	·60	23	17	55	24	24	17	18
VIII.		Manchester	1·44	—1·25	·30	23	15	58·5	24	20·6	17	15
IX.		York	1·44	— ·55	·60	23	14	52·5	24	22	17	16
„		Skipton (Arncliffe)	3·46	—1·35	·82	23	12	45	25	20	17	20
X.		North Shields	1·69	— ·66	·28	8	22	52·8	24	22·8	16	16
„		Borrowdale (Seathwaite)	8·32	—5·08	2·53	26	11	...	...	...	...	...
XI.	WALES.	Abercarn	5·34	...	1·40	23	12	51	§24	26	15	13
„		Haverfordwest	5·68	+2·23	1·91	23	13	55	25	25	3	23
„		Rhayader (Cefnfaes)	4·03	+ ·19	1·66	24	14	52	...	15	...	8
„		Llanberis (R. Victoria Hotel)	4·94	...	1·69	23	8	...	...	...	...	...
XII.	SCOTLAND.	Dumfries	1·72	—1·26	·72	23	9	51	25	19·5	17	16
„		Hawick (Silverbut Hall)	1·70	...	·30	23	16	...	...	17	20	20
XIV.		Ayr (Auchendrane House)	1·09	—2·64	·28	23	11	56	24	16	§§16	21
XV.		Otter House	2·00	—2·64	·66	24	8	53	4	23	16	13
XVI.		Leven (Nookton)	1·18	— ·89	·32	9	16	56	24	22·4	27	17
„		Stirling (Deanston)	2·07	—1·46	·71	23	18	58	26	16·3	17	...
„		Logierait	2·61	...	1·22	23	11	...	...	...	...	...
XVII.		Ballater	5·54	...	1·49	23	23	54	3	1	17	24
„		Aberdeen	2·29	...	·66	23	20	54·8	24	18·2	17	14
XVIII.		Inverness (Culloden)	·93	...	...	...	...	...	...	...	...	...
„		Fort William	2·45	...	·56	29	11	52	25	17	21	16
„		Portree	2·62	—6·41	·68	23	11	53·5	25	13·4	16	12
„		Loch Broom	2·53	...	·56	10*	13	...	...	...	...	...
XIX.		Helmsdale	2·73	...	·41	23†	16	...	...	...	...	...
„		Sandwick	2·08	—1·25	·53	23	15	...	..	6	‖‖16	...
XX.	IRELAND.	Cork	?8·03	...	1·73	18	14	...	...	...	...	...
„		Waterford	4·71	+1·82	·90	22	20	...	...	...	...	...
„		Killaloe	3·06	—1·26	·53	25	15	58	24	22	16	11
XXI.		Portarlington	3·02	— ·29	·31	12	27	49·5	24	23	17	17
„		Monkstown	5·07	+2·58	1·08	26	23	58·7	24	23	2	8
XII		Galway	3·37	...	·90	18	17	58	‖ 2	25	16	8
„		Bunninadden (Doo Castle)	2·70	...	·75	25	12	54	24	...	..	16
XIII		Bawnboy (Owendoon)	3·93	...	·90	27	15	...	...	...	...	...
„		Waringstown	1·95	...	·45	23	16	54	**23	17	15	18
„		Strabane (Leckpatrick)	2·27	...	·61	25	13	59	24	19	16	21

*And 30th. †And 27th. ‡And 25th. §And on 25th, 27th, & 31st. ‖And 4th & 30th.
**And 26th. ††And 17th. ‡‡And 17th & 21st. §§And 17th. ‖‖And 17th.
+ Shows that the fall was above the average; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

CAMDEN TOWN.—TS on 30th. Frequent S showers during the month.

LINTON PARK.—The first five days dry, the rest a continuance of sleet, S or R, with very little sunshine, and fewer high winds than is usual in March. Very distinct T and L on evening of 30th. Prevailing winds E., N.E., and N.; 23 frosty nights, and altogether the most wintry March for many years.

SELBORNE.—Frequent S from 7th to 22nd, when the wind changed from N.E. (whence it had blown almost without interruption from the 1st) to S.W., with a dense fog and sudden rise of temp. Aurora on 26th. The temp. of the month lower than I have ever known it in March since I have kept a register. In the first three weeks the mean max. was 35°, mean min. 26°; mean max. for whole month 40°; mean min. 29°. From 29th to the end of the month violent and cutting winds from N.

HITCHEN.—Very frequent S between the 7th and 23rd.

BANBURY.—S on 13 days between the 6th and 22nd. Fog on 23rd, and higher floods on 24th than known for many years. Vegetation scarcely advanced since the end of last month. Bar. on 2nd (reduced), 30·83; mean temp. of month, 36°; mean of first three weeks, 33°·3. L on 9th.

WISBECH.—A wintry month. Lunar halo on 16th. Peach in bloom on 30th.

CULFORD.—March is generally expected to be a trying month in this part, from the prevalence of east winds, but the one just closed is supposed by the oldest inhabitants to be the roughest in their remembrance, and it maintained its character to the last, the max. on 31st being only 49°, and min. 24°. Mean, 37°·5.

TAUNTON.—Prevalence of E. and N.E. winds. Inundations very general, and higher than known for many years.

ORLETON.—The average temp. at 9 a.m., for the first 22 days was only 33°·9, and the ground was covered with S to a depth varying from three to six inches where not drifted. S fell on 6th and following days till the 14th; also on 17th, 18th, 19th, 21st, and 22nd, frequently accompanied by strong winds, which, on the 19th and 21st, rendered many of the roads impassable from S drifts till cut through. On 23rd a rapid thaw, which caused the greatest flood in the river Teme since 1852. The Severn was also greatly flooded. After the 22nd the weather was rainy and warm, but the temp. of the whole month was 4° below the average.

WIGSTON.—The total rainfall for January, February and March is nearly 2 in. above the average of the last 11 years. The temp. much below the average.

DERBY.—The month up to 23rd remarkably cold, with biting N.E. wind. The temp. on 16 nights far below freezing.

MANCHESTER.—H and T on 30th. Very cold month, and for the first three weeks continuance of cold N.E. winds.

ARNCLIFFE.—E. winds. A very heavy fall of S in the second week; the whole month wild and ungenial.

NORTH SHIELDS.—S on every day from the 6th to the 22nd except two—the 10th and 21st. Fog and solar halo on 25th.

SEATHWAITE.—Drought to the 24th, except a little S. Hard frost with strong E. winds during the first three weeks.

WALES.

ABERCARN.—A very severe month, 20 inches of S having fallen in these parts. It snowed more or less for 11 days, and continuously for nearly 3 days. A most trying month for aged or weak persons. A great loss in sheep and lambs. Heavy and destructive floods at the latter part of the month from the melted S.

HAVERFORDWEST.—One of the most severe months of March on my record. Temp. uniformly low night and day to the 23rd, when a thaw commenced, accompanied by enormous quantities of R and terrible storms of wind. Air bleak and cold to the end, with the exception of the 28th and 31st, which were fine. The rainfall in this month should, in my judgment, be stated as more (say +·70)

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than was actually registered, the S having fallen heavily on 8 days, and drifted in many places to the depth of 10 or 12 ft., but having been so dry that it blew out of the funnel during the violent winds.

CEFNFAES.—The weather during the whole month very inclement, and the storm of frost and S from the 1st to the 21st more severe than any recorded here since 1814. Great loss in sheep and lambs.

SCOTLAND.

DUMFRIES.—The weather very ungenial. Wind from N.E. to the 23rd. S or H on 11 days, but the fall not heavy except on the higher hills, which continued white till the 31st. Temp. below the average for February, and lowest for March for eight years. Vegetation much checked thereby. From the 23rd the weather milder, but R, and occasionally S, less or more nearly every day.

SILVERBUT HALL.—Old men of 70 are of opinion that this has been the coldest March ever felt by them. Farmers are loud in their lamentations over the scarcity of fodder, and gardeners moan over the death of their favourite plants.

AUCHENDRANE HOUSE.—Under the influence of Polar currents of air, this month was cold and dry, with a considerable amount of sunshine, and frequently chilly winds; after the 23rd the weather became mild, wet, and boisterous; there was a slight snow-storm on the 12th, which melted as it fell; none of the great snow-storms of the month reached this locality. The pools in the river were frequently covered with ice, and loose ice occasionally floated about on the streams, as in January. There were no inundations from rivers here, as in so many other places. There was ice from the 12th to the 22nd, when the game of curling was played on a loch near Kilmarnock, an event that is said never within memory to have happened at so advanced a period of the spring.

OTTER HOUSE.—T on 27th; cold, dry, and severe frost till the 23rd; afterwards R or S and H showers, with equinoctial gales, almost to the end; at the close of the month mild, birds singing, trees budding, and flowers blooming.

LOGIERAIT.—Month opened with severe frost to the 9th; then cold E. winds till the 20th; afterwards a heavy fall of S on the 22nd and 23rd; since then more mild and genial; distant T on 27th. Agricultural labour much retarded.

BALLATER.—A very stormy month after the first week, with occasional heavy falls of S. The railway blocked up on the 15th, and again on 22nd; the temp. continued low throughout, falling to 1° above zero on 17th and 21st, and below 10° on 13th, 14th, and 18th. The lower grounds were free from S by the end of the month, and agricultural operations resumed.

ABERDEEN.—The month has been one of cold, unseasonable weather, with bare frosts, and though S or sleet fell on 15 days, there never was sufficient depth to protect vegetation; the greatest depth at any one time was not more than 1½ or 2 inches. Mean temp. 36°·5. being 2°·6 below the ten years' mean. Frequent auroræ during the month.

CULLODEN.—Fog on 4th. Aurora on 7th, also L and some H. A few hailstones alone on the 8th. S nearly every day.

ROSSE PARSONAGE, FORT WILLIAM.—Here as elsewhere the early part of the month was very dry and bitterly cold, but we have had no S except a little sprinkle, which a high wind prevented getting into the gauge. The wind till the 21st was from E. and N.E., it then changed to S.E. and blew a gale; since that day it has been moist, and generally rather mild, with occasional sleet and S. on the hills. A luminous arch, very distinct and defined, spanned the heavens from E. to W. on the night of the 6th, the day of the solar eclipse.

LOCHBROOM.—This month had truly a peacock's head but an adder's tail. The beginning was beautiful; much labour was done, but about the 9th intense frost commenced, and continued until the 24th, which was a terribly showery day, but that week turned out the first sowing days of the season, which is a fortnight later than usual; the last three days again turned out as boisterous and sweeping as the tradition of the ancients ever made them.

PORTREE.—Very dry month; from the 25th of February to the 23rd of March only 0·14 in. of rain fell—a most unusual occurrence in this locality. A very cold month; frost on every day except the 2nd, 6th, 26th, 27th, and 28th; the last

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week very stormy, with S, H, and strong, cold winds, very trying for the young lambs.

SANDWICK.—A very cold, dry month, both R and temp. below the average; a long continuance of snow-storms from the 10th to the 23rd. The min. temp. on grass, registered on the 17th and 18th (6°), lower than I ever recorded.

IRELAND.

KILLALOE.—A month of unusual severity here for March; great prevalence of violent and very cold N.E. winds, with frequent snow showers.

MONKSTOWN.—Aurorse on the 7th and 28th.—A most severe month, the most so for many years. It commenced fine and frosty, but on the 7th the S again fell, and continued to do so at intervals till the 21st. On 22 days the wind was easterly, and frequently very wild. On the morning of the 16th the atmosphere was so clear that the mountains 60 miles distant, with their snow-capped peaks, were very distinctly seen, and in the evening the Dublin mountains, covered with S down to their bases, were beautifully depicted. This preceded as violent a storm as we have had here for a long time from S.E., and during which a small steamer was wrecked on our coast. Gales also on 21st and 23rd.

GALWAY.—Slight fall of S on 15th, and a heavy fall on 18th.

DOO CASTLE.—T S with H on 25th. One of the most severe months on record; a cold, strong wind, generally from the E., prevailed for three weeks, with frost every night from the 1st to 23rd; to complete the sad character of this blighting month, it closed with heavy R, which completely saturated the land. Very little attempted in the way of spring culture till the end of the month, and no grain to my knowledge sown in this locality to this date, 3rd April.

OWENDOON.—T on 23rd and 25th. H on 24th. Latter part of month very wet.

WARINGSTOWN.—Cold, parching easterly winds, accompanied by frost and occasional slight falls of S from 1st to 23rd, when the wind changed to S.E. with heavy R, and a week of fine though showery weather followed. The last two days intensely cold, with H showers.

LECKPATRICK.—From 1st to 21st constant E. winds, which changed on that day to S.E. Gale from S.E. on 23rd, ending in S. On 25th squalls, heavy downpour and T. 29th, gale from W. Farming operations much retarded.

DERIVATION OF THE WORD "ANEROID."

To the Editor of the Meteorological Magazine.

SIR,—Your correspondent "F. W. S.," rather overstates his case. The word "*νηρός*" is not only "somewhat rare," but never once occurs in the Classics, so far as I can discover. Moreover, his assertion that the form *ναρός* "was good enough for Sophocles and Æschylus" indicates (at first sight) something more than its occurrence in a single fragment of either poet, cited respectively by a grammarian and a lexicographer, and resting upon no other authority. "A rare and old word, probably contracted from *νεαρός*," is the dictum of Liddell and Scott.

"F. W. S." explains away the terminal *ειδες* in a very ingenious manner; but as a scholar he must feel that his explanation is quite unsound; *ἀνηροειδες* (supposing such a word to be coined) would mean "unfluid-like"; not "unlike fluid"; much less "belonging to a class of *ἀνηρά*."

A man sufficiently versed in Greek to be acquainted with the word *νηρός*, would scarce think of adding the terminal *ειδης* (neut. *ειδες*) to a privative compound.

As Mr. Barham well observed, the only practicable derivation for aneroid is from *ἀνηρ*. Supposing the automatic idea to be wholly inadmissible, may not the inventor have had in his mind some of those quaint Dutch and German figures which indicate the weather, and first have applied his new principle to some such popular form?

By the bye, no one has told us who this inventor was. Perhaps some of your correspondents, or yourself, will answer this question.—Yours obediently,

R. D. B.

[We could not venture to decide the "derivation" question, but the following brief extract may be satisfactory at once, to both F. W. S. and R. D. B.:—"As its name implies it is constructed 'without fluid.' It was invented [about 1846?] by M. Vidi of Paris."—*Negretti's Treatise on Meteorological Instruments*, page 50.—ED.]

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

XVI.] MAY, 1867. [PRICE FOURPENCE, or 5s. per ann. post free

HEIGHT ABOVE SEA LEVEL.

WE conceive it to be quite needless in these pages to state the many reasons which combine to render an approximate determination of the altitude of every meteorologist's residence a *sine qua non*. And yet our uniform experience is that the wildest guesses are often made. This is certainly not the fault of the Ordnance Survey Department, whose labours in this branch are most valued by those who have followed (however distantly) in their steps. But for several reasons their labours are not available to all. In the first place, their publications are not very accessible, their levels in many districts are untaken, or unpublished, and last, not least, many observers find great difficulty in getting a level line run from their residence to the nearest "bench mark." (See margin.)*

For these reasons we have resolved to attempt to improve the present state of affairs, by undertaking the collection of good barometric observations, from as many stations as possible, during the 10 days, May 24th to June 2nd to be made at 9 a.m., 3 p.m., and 9 p.m.; or, if this is impracticable, at the first-named hour only, but the more complete the returns, and the more numerous, the more correct the result.

It may be well to point out that simultaneous and combined observation such as this is necessarily occasional, and therefore we would suggest that our readers should mention the arrrangement to their friends, and perhaps also in the local papers, because the success, accuracy, and utility of the proposal, mainly rests on the widespread adoption of the suggested observations.

We by no means desire to substitute barometric, for spirit levelling, and are prepared to assist, as far as in us lies, (by communicating the height of nearest bench marks), in enabling observers to obtain these most correct results. But where levelling is impracticable, the plan we intend to adopt will give within 10 or 20 ft. the height of the barometer if its error is known, or the error of the barometer if its height is known. Observers whose barometers are untested, and also have not had the levels run up to their own houses, are recommended to send the exact position of the same, with reference to the nearest church, when every effort will be made to assist them. With every copy of this magazine will be sent a form prepared for the entry of the observations, additional copies will be readily furnished, and resultant altitudes shall be published as soon as the discussion is completed, but that will not probably be until the autumn.

All communications to be addressed to G. J. Symons, Esq., 136, Camden Road, N.W., the word "Altitudes" being in the corner.

* These are usually cut on churches, milestones, bridges, &c., about 1 ft. above the ground.

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METEOROLOGICAL PERIODS.

By G. D. Brumham, Esq.

In each year the summer quarter commences within a few minutes of the same time of the day that it did 29 years before, but the other quarters, and especially the winter one, show a considerable difference in this respect. Having discovered these facts (I say discovered, because I am not aware that any one else has noticed them), I was led to think that there ought to be a corresponding return of remarkable summers, &c., and on examining a chronology of the seasons, I found that such was really the case seven times in eight. From 1746 to 1837 there were about 53 very hot, fine or dry seasons. These 53 seasons I have given below in the left hand column, and the seasons that returned after an interval of 29 years will be found in the right hand column. It may be well to state that, though, as herein shown, the recurrence is very frequent, there is apparently some cause which prevents perpetual recurrence after intervals of 29 years, the facts appearing to indicate rather a three-fold recurrence, and then modified intensity, or even the reverse—*e g*, 1750, 1779, 1808, and 1837, a year of modified intensity. The following records, which are chiefly taken from Mr. Whistlecraft's valuable works,* will show how remarkably true is this 29 year cycle.

Great Droughts, Heats, and fine Warm Seasons.

1746.—An exceedingly hot and dry summer occurred this year.

1747.—Dry season.

1749.—Excessive heat at the beginning of July. Ther. 88° in the shade.

1750.—Excessively hot spring and summer. Ther. in July at least 96° in the shade on several days.

1757.—Very great heat in July.

1759.—A hot summer and dry.

1760.—Very hot and dry summer.

1762.—A very hot and dry summer, and a very dry year.

1765.—A very dry summer, and often very hot.

1771.—A very dry summer and year.

1775.—A hot and dry summer.

1776.—Great heat in July and August. Chiefly dry and fine from May.

1778.—*Very* hot and fine summer, especially July.

1779.—An extremely hot summer. Ther. 94° in July.

1775.—Mr. Glaisher says that this summer was dry and hot.

1776.—Great heat in July and August. Chiefly dry and fine from May.

1778.—Very hot and fine summer. Excessive heat in the first half of July.

1779.—Excessively hot spring and summer. Ther. in July 94° in the shade.

1786.—June and July were moderately fine.

1788.—A hot summer and a dry year.

1789.—A *rather wet summer*, but August was fine.

1791.—A very hot and dry summer, and a *very* dry year.

1794.—Rather a dry summer, and very hot from June 12th to July 18th.

1800.—Excessive drought from June 22nd to August 19th, then very wet.

1804.—Extremely hot and dry in September.

1805.—Very hot in August. Near 1° above the average.

1807.—*Very* hot and fine summer, especially July and August.

1808.—An extremely hot summer. Ther. 99° in July.

* "Climate of England," by O. Whistlecraft, London, 1840; "Rural Gleanings," by O. Whistlecraft, London, 1851.

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1780.—A very hot summer. In May, ther. 84°.
1781.—A hot, dry summer.

1783.—A remarkably hot summer.
1788.—A hot summer and dry year.

1791.—A very hot summer and dry.

1793.—Intensely hot and dry part of summer.
1794.—Very hot June 12th to July 18th, and rather a dry summer.
1795.—Most extraordinary heat at the beginning of September; the ther. on two days 90° and 91° respectively.

1797.—Heat unusually great part of summer. Ther. in July from 89° to 91° about the 16th and 27th.
1798.—A very fine hot summer.
1800.—Excessive drought for seven weeks in summer; then *very* wet.
1801.—A fine summer and good harvest.
1802.—Hot and dry two months of the summer (August and September.)

1803.—Very hot and dry summer.
1804.—A hot and dry September.

1805.—Very hot in August.
1806.—A hot summer.
1807.—Very fine and hot summer.
1808.—A fine and extremely hot summer.
1810.—Hot, with much thunder, during summer.
1811.—A very warm spring, and great heat in summer.
1813.—A fine and good summer.
1814.—Very hot in July. Ther. 88°.

1815.—Remarkably fine from March to October.
1817.—Excessive heat during part of summer. In June, on the 21st and 25th, ther. above 87°.
1818.—A remarkably dry and hot summer. Ther. in June 89°, and in July 90°.
1819.—A hot and dry summer.
1820.—Excessive heat in June and July; max. 87° in each month.
1822.—Great heat and drought part of summer. Very fine till October.
1825.—Warm and early spring. Very hot and fine summer. Ther. in July 90°.
1826.—Very hot, fine and dry summer; max. in June 90°, in July 88°.

1809.—A fickle summer, but a very hot May.
1810.—A hot summer, with much thunder. A dry year to October.
1812.—*A cold summer.*
1817.—Great heat during part of the summer.
1820.—A very hot summer. Excessive heat in June and July.
1822.—Great heat and drought part of summer.
1823.—*A cold and showery summer.*

1824.—Most extraordinary heat at the beginning of September; max. 86¼°. At Greenwich the 2nd was the hottest day ever recorded in September.
1826.—Heat unusually great, with excessive drought. Ther. in June 90°, and in July 88°. A very fine summer.
1827.—Fine and hot summer.
1829.—Fine and warm for about seven weeks in May and June, then *very* wet.
1830.—Very hot July and good harvest.
1831.—Hot and dry two months of the summer (July and August). A wet year.
1832.—Summer chiefly fine.
1833.—*A changeable time after June 11th.*
1834.—Summer generally very hot.
1835.—A very hot and dry summer.
1836.—A fine summer, hot in July.
1837.—A fine and rather warm summer.
1839.—A summer of much thunder and rain, with hot intervals.
1840.—A very warm April, and great heat in summer. Also a dry year.
1842.—Fine and very hot summer.
1843.—Extreme heat in July. Ther. 90°.
1844.—Remarkably fine from March to September.
1846.—Excessive heat in June, and "notably hot summer."

1847.—A remarkably dry and hot summer. Ther. 89° in July. In Sussex 98° in July.
1848.—*A wet summer.*
1849.—Excessive heat in July; max. 89°.
1851—Great heat and drought part of summer. Very fine till end of October.
1854.—Warm and early spring, fine and hot summer. Ther. in July 88°.
1855.—Summer and autumn fine and very warm; max. in June 86°, in July 82°.

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1827.—Fine and hot summer, and good harvest.

1830.—Warm and early spring, and a very hot July.

1832.—Summer chiefly fine. Great heat about August 10th, and very hot at the end of September.

1833.—Great heat in May; ther. 85½°; afterwards no day all summer so hot. Fine to June 11th, then a changeable time.

1834.—Sharp drought in spring and greater part of summer, and generally very hot.

1835.—A very hot and *dry* summer, and very great drought in July and August; max. in the latter month 86°.

1836.—Fine summer, hot in July, but a wet autumn, especially October.

1837.—Fine and rather warm summer, but still the mean temp. of every month from March to September was *below* the average.

1856.—Fine and very hot summer and good harvest.

1859.—Warm and early spring, and a very hot July.

1861.—Summer chiefly fine. Great heat about August 12th, and fair and hot at the end of September.

1862.—Great heat in May; ther. 84°; afterwards no day all summer so hot. Very fine to June 4th, then a changeable time.

1863.—Sharp drought in spring and summer, and generally very hot.

1864.—A very hot and *dry* summer, and very great drought in July and August; max. in the latter month 86°.

1865.—Very fine summer, generally hot, but a wet autumn in October.

1866.—Fine and warm part of summer, but very wet at the close, and the mean temp. of every month but one from May to September was below the average.

Remarkably Wet and Cold Summers, Wet Years, &c.

1739.—A very wet season.

1756.—A wet summer.

1768.—A very wet summer and year.

1782.—A very rainy summer and year from July.

1785.—A stormy summer.

1787.—Mr. Glaisher says that there was a cold summer this year.

1792.—A very wet September, late and bad harvest.

1797.—A wet summer from August.

1799.—An extremely wet summer from July 8th, and very bad harvest.

1800.—Great rains in August and September, and a bad harvest.

1810.—Much thunder in summer. Very wet autumn after September; flooding rains in November.

1812.—A treacherous summer; rainfall much above the average in the year, but a fine September.

1816.—Very rainy and cold July and August; a very bad year.

1821.—A wet summer and year, though fine in July and August.

1823.—Showery summer, and wet in autumn, with extensive floods.

1824.—A wet summer and year.

1828.—A very wet summer.

1829.—A wet summer.

1768.—A very wet year from Feb.

1785.—A stormy summer.

1797.—A very wet summer and year from August.

1811.—A showery summer, though so hot.

1814.—Showery and cold till end of June.

1816.—A remarkably cold and wet summer, late season, and a bad year.

1821.—A wet summer and year; more than 31 inches of rain fell. A bad harvest.

1826.—*Very hot and fine summer.*

1828.—An extremely wet summer from July 9th, and very bad harvest.

1829.—Great rains in July, August, and September, and a bad harvest.

1839.—A summer of much thunder and rain. Very wet autumn, especially in November.

1841.—A wet summer; rainfall very much above the average in the year, but fine September to the 22nd.

1845.—Very wet, gloomy, and cold part of July and August; a very bad year.

1850.—A stormy summer, though so hot at times.

1852.—Extremely wet after July all through autumn.

1853.—Wet summer and year.

1857.—*A very fine summer.*

1858.—*A very fine summer.*

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1831.—*Very* wet year and part of summer; 33½ in. of rain fell at Thwaite.

1833.—A fickle summer, and often wet.

1836.—A wet autumn. Extremely wet in October and November.

1837.—Although often fine and warm, in one respect this was a very cold season, for every month from March to September had a mean temp. below the average.

1860.—Very wet year and chief part of summer; 36 in. fell at Thwaite.

1862.—A fickle summer, and often wet.

1865.—Wet autumn. Extremely wet in October.

1866.—Although often fine and hot in June and July, every month but one from May to September had a mean temp. below the average. A wet year.

G. D. BRUMHAM.

Abstracts of Meteorological Works.

UNDER this title we purpose, as opportunity offers, epitomizing the literature of Meteorology, and placing the leading contents before our readers, thus giving them access to many rare and curious works. Sometimes, perhaps, these abstracts may facilitate research either as to theories or facts, and trace ideas and discoveries to their true source. Our aim being, as far as possible, to place our readers in the same position as if they had the volume under notice, we shall generally quote *verbatim*, connecting the quotations by a running commentary on the contents of the volume.

PUBLISHED A.D. 1809.

Meteorological and Miscellaneous Tracts, applicable to Navigation, Gardening and Farming, with Calendars of Flora, for Greece, France, England and Sweden. By Colonel JAMES CAPPER. Cardiff: J. D. Bird. 212 pages.

Written during the warlike period at the opening of the present century, the preface of this peaceful volume opens with a sentence which reads strangely to us who are so accustomed to roam where we will, without let or hindrance.

"The first of the following tracts originated in answer to various correspondents who were anxious for information respecting the climate of such places in the South of Europe as were neither immediately under the command of, nor accessible to the enemy, and where, consequently, they might safely retire to avoid the inclemency of a severe winter in England."

This first tract is entitled "Observations on the Causes and Consequences of the Temperature of Air in different Latitudes;" but the title is scarcely an appropriate description of a short article pointing out the advisability of persons of a delicate constitution choosing a suitable locality in our own country, rather than undertaking long journeys to the shores of the Mediterranean. The second tract is nominally on "The effects of Lunar Influence on the Weather," but really consists mainly of two digressions, one on the indication of coming storms afforded by low barometric pressure, the other on the premonition rendered by Auroræ, in which Col. Capper quotes a letter from Mr. Winn to Dr. Franklin, dated Spithead, Aug. 12th, 1772, wherein the

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writer states that in every one of twenty-three occasions when he had observed Aurora Borealis it was followed by hard southerly or south-westerly gales, with hazy weather and small rain. The question of Lunar Influence can hardly be said to be considered. Premising two points—(1) That Col. Capper attributes the effect not directly to the moon, but indirectly, that is to say through the tides; (2) that atmospheric electricity causes almost everything, especially rain, we may, as a specimen of the work, quote almost all that is said as to Lunar Influence :—

"Virgil observes that when the moon first collects the returning rays, if her horns are obscured by dark clouds, a storm both by land and sea may be expected, but should she spread a virgin blush over her face, there will be wind. If again, at her fourth rising, she appears clear and not with blunted horns, let this be considered as an infallible sign of settled weather, not only for twenty-four hours, but for the whole lunation.

"If in this place the word tide be substituted for that of the moon, this prognostic will be found to correspond nearly with our system. The middle, but not the greatest height of the spring tide being, as we have stated, nearly about the time of the moon passing the sun, the fifth flood after the conjunction which falls on the third day is the highest spring. If, therefore, at the fifth or highest tide after the syzygee (*sic*), a sufficient quantity of the electric fluid has been brought from the sea to elevate and consolidate the clouds, the horns of the moon on the fourth day will probably be clear and distinct, and then a series of fair weather may with reason be expected. But on the contrary, should an extraordinary quantity of electric fluid have been brought in by the springs, as is often the case, particularly at the equinoxes, and the land clouds at the same time be in a negative state, wind and rain will probably ensue, and the horns of the moon will at least appear obtuse, if not be wholly obscured, and the weather consequently may, in that case, continue unsettled for several days."

The remaining tracts are scarcely within our province, their subjects being "On the Situation and Form of a Fruit and Kitchen Garden," and on "The Physical, Moral, and Political Effects of Late Hours," but both contain much sound advice.

The Appendix forms more than half the volume, and opens with a copy of the short "Memoir by Dr. Franklin, read before the Royal Academy at Paris, April 14th, 1779."

Col. Capper is most at home in the next paper, "Observations on Whirlwinds and Waterspouts," wherein he notices first the similarity of conditions producing the two phenomena, then points out their great frequency on the coast of Guinea and in the Straits of Malacca, occasional appearance in the Mediterranean, "and even in England when the summer is unusually hot." Without binding ourselves to absolute number and date, we have no doubt that their frequency in this country of late years (one or two in each year on an average), would have rather surprised the gallant Colonel, who evidently considered a waterspout in this country quite a *rara avis*. The following is his explanation of the phenomenon :—

"Notwithstanding the superior body of air in hot seasons and places is more dense and heavy near the point of congelation in the atmosphere, yet the rarefied air below will still continue to support it whilst it remains undisturbed; but the equilibrium once destroyed, either by ascending or descending electrical fluid, the body of cold air instantly forces its way through the rarefied medium, and produces

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either a hurricane, a whirlwind, a hard squall of wind and rain, or a waterspout. The force and duration of the wind, or the number of waterspouts, may, in some measure, depend on the quantity of cold air that descends, and the rarefied state of the air at that time in the atmosphere. The body of cold air in descending, as it penetrates the warmer regions filled with aqueous particles, condenses and renders the air visible in various forms. * * * The form they assume, as waterspouts, is produced from the same cause as sinking any heavy body in water. The air in a whirling motion receding every way from the centre, as an axis of the waterspout, leaves there a vacuum which cannot be filled through the sides; the whirling motion of the condensed air acting as an arch prevents it, and thus the shape it assumes is that of the proboscis of an elephant. This singular resemblance is the more striking from its motion, which is sometimes serpentine; but where a great quantity of water is collected in these spouts, either by the separation of the aqueous particles, from the internal air, or possibly from the composition of water in it, by the combination of hydrogen and oxygen, the waterspout, from its gravity when filled, forms a straight line, and the water falls into the sea with a loud splashing noise, not unlike that of a great cataract. * * * It is found that in some instances they have been destroyed by firing a gun at them; but the shot might as well be spared, for probably it is the explosion of the powder that rarefies and agitates the air, and consequently destroys the cohesion of the cold and dense body of it in which they are enveloped."

The next article is devoted to a recapitulation of "The Discovery of Atmospherical Electricity;" then follow chapters on the barometer, thermometer, with tables giving the mean monthly pressure, temperature, and rainfall at Cathay, near Cardiff, 60 ft. above the sea level. Very little information is given as to the time of observing or instruments employed; the barometer, however, was taken at 8 a.m. and 2 p.m. The thermometer was in a courtyard, 7 ft. above the ground. Of the size or position of the rain gauge nothing is said; from the amount we infer it must have been on a roof or wall. So far as we can ascertain, perfect uniformity of practice was maintained throughout, therefore an abstract of the results may be acceptable.

Year.	1800.	1801.	1802.	1803.	1804.	1805.	1806.	1807.	Mean.
Mean Bar.	29·74	29·81	29·82	29·87	29·78	29·99	29·99	29·90	29·79
,, Temp. ...	51·9	51·8	49·8	51·0	51·0	49·0	51·0	49·8	50·7
Total Rain ...	26·82	24·10	22·77	20·59	27·01	20·28	27·86	20·68	23·76

On December 28th, 1798, the thermometer fell to 11°, being the lowest recorded there.

Concerning hail, Col. Capper remarks:—

"Hail, in the opinion of Beccaria, is an aqueous concretion formed in the higher regions of the atmosphere, where the cold is intense, and where the electric matter abounds. The form and dimensions of it are various. It sometimes assumes a pyramidal, as well as a round shape, and at others a stellated figure like snow, but both the shape and size depend very much on the height of the clouds in which they are formed. The largest and those of the most irregular figure, fall from those clouds of the least elevation. The circumstance, however, which tends to show the principal cause of its formation is, that all storms of hail are most violent where electricity is most intense. On this point Beccaria, Franklin, the Abbé Nollet, and Mr. Monges perfectly agree. * * * The Count de Tressan dissolved a certain number of hailstones which fell at Toul on the 11th of July, 1753. They produced nearly a pint of water, in which were found nearly two grains of a calcareous substance, which fermented with acids, and which, no doubt, had ascended from the earth with other vapours. * * * Mr. de la Hire found

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the density of snow compared with water nearly as six to one. Père Cotte likewise sometimes found nearly the same proportions, but much more often one to eight. The difference may probably be ascribed to the size of the flakes and the temperature of the air. M. Van Swinden, an able and correct philosopher, observes that in 80 experiments which he made at Franeker, in Friesland, in the years 1772—75, he found in 18 cases less than six, but he seems to think the result of the whole would be 9¾ to 1."

The remaining articles are on "The Temperature of different Latitudes, indicated by the Calendar of Flora," a second on "Late Hours," a series of French extracts bearing upon the certainty of gales following low barometric pressure, and lastly a table of Lunar Cycles for 228 years. Two points alone seem worthy of notice:—(1) Speaking of the indifferent meteorological data which then existed, he suggests that the best guide as to the time for undertaking the various operations of husbandry is afforded by the state of the hedges, shrubs, and trees. (2) Colonel Capper quotes from Toaldo's "Saggio Meteorologico," and also from his "Meteorological Saros," on behalf of the existence of a meteorological cycle of 18 years 11 days (*i.e.* a lunar cycle.) Query —Had Howard seen these works when he published his treatise on "A cycle of eighteen years?"

EDITOR'S GOSSIP, CORRECTIONS, ADDITIONS, ETC.

We desire a few words with our readers on several points, so string them all together. In the first place, we must apologize for the badness of the engraving in the last number of this magazine; it was a first trial of a new and much vaunted process, but one we shall certainly not try again.

We are repeatedly asked to state where the best meteorological instruments are to be procured, but, however impartial our advice, it would be sure to displease, and to be called prejudice, puffing, &c., by all but those selected for recommendation, and as we believe there is no great difference between the instruments sold by the principal opticians, we think it far better to leave each observer to choose for himself.

A very provoking illustration of the mischief arising from a single wrong figure has occurred in *British Rainfall*, 1866, provoking, because it ought not to have occurred, involves several corrections, and, we presume, some discredit to ourselves. The error is, that the true total of the 24 inch gauge, belonging to Colonel Ward's magnitude series, is 33·867, not 33·167 as stated on page 34. This single error involves the correction of various errors in the tables on page 28, as shown in the corrected copy, which we have also had printed on a loose slip, so that they may be pasted over the faulty ones. In the sixth line from bottom of same page, 2 per cent. is reduced to 1. We do not see that it in the slightest degree affects the deductions or argument, except to strengthen them, by reducing the results of the three years to closer agreement.

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Relative fall indicated by gauges of different sizes at Castle House, Calne, all 1 foot above the ground.

Receiving Surface.	1 inch diam.	2 inch diam.	4 inch diam.	5 inch diam.	6 inch diam	8 inch diam.	12 in. diam.	24 in. diam.	5 inch square	10 in. square	5 inch flange.
1864.....	·93	·96	1·01	1·00	1·03	1·04	1·01	1·00	·98	1·00	1·02
1865.....	·94	·97	1·00	1·00	1·02	1·02	1·00	1·00	1·00	1·00	1·03
1866.....	·92	·95	1·00	·99	1·03	1·03	·99	1·00	·98	·98	1·01
Mean	·93	·96	1·00	1·00	1·03	1·03	1·00	1·00	·99	·99	1·02

	Gauge 24 inches diameter.	Gauge 8 inches diameter, Magnitude Series.	Gauge 8 inches diameter, Elevation Series.
1864	1·00	1·04	1·04
1865	1·00	1·02	1·02
1866	1·00	1·03	1·01
Mean	1·00	1·03	1·02

The following paragraph is an interesting addition to the meteorology of 1866 (*Brit. Rainfall*, 1866, p. 51.) :—

"PENTYRCH.—December 14th. At 2 a.m. a heavy T S, with H the size of peas, which lay half an inch deep. A tree was struck on the hill above my house, the bark furrowed three inches wide from top to bottom, but no branch broken.—F. G. EVANS."

The following alterations and additions will tend to complete *Brit. Rainfall*, 1866. We do not say on whom the onus of the errors rests—some are ours, some are not—none are intentional, and what can it matter?

Page 87, 6 lines from bottom, Rev. L. M. Majendie should be Rev. H. W. Majendie.
" 90, 5 " " top, 29·93 should be 27·93.
" 92, 5 " " " Strike out the asterisk.
" 102, 4 " " " 47·68 should be 46·68
" " 15 " " bottom, Patterdale could not have had 315 wet days.
" 103, 12 " " top, For Langharne, read Carmarthen.
" 108, 21 " " " Before (Hynish) enter Tyree.
" 111, 11 " " " Holme Manse, above sea 30 ft?
" " 6 " " " Papa Westray, " " 80 ft.
In *Met. Mag.*, Vol. II., p. 35, Calne, for 3·11 read 3·35.

ENTRY OF MINIMUM TEMPERATURES.

To the Editor of the Meteorological Magazine.

SIR,—I am obliged for your observations in reply to my note inserted in your last number of the *Meteorological Magazine*, but referring again to the latter portion of them, I would be glad to know how (if the rule for entering the day on which the min. temp. occurs be accepted as laid down in your remarks) an observer is to ascertain on which day the min. temp. *really* occurred, who only looks at his thermometer once in the 24 hours; for supposing the thermometer at 9 a.m. on the 1st of any month, registers 50° and is then set, and that the next morning the minimum is found to have been 45° during the preceding 24 hours, the thermometer at the time standing at 55°, how can the observer tell whether the min. temp. was reached on the 1st, after he had set his instrument, or early on the morning of the 2nd, which is, as a rule, the coldest period of the day?

Yours very truly,
ARTHUR PIM.

[We hope neither Mr. Pim nor any other observer will be affronted at our saying that we consider no observer should be allowed to *think* whether the min. occurred on the 1st or 2nd; he should, we believe, act like a "manly automaton," and enter against the 2nd whatever min. he finds at 9 a.m. on that day. We however think that a congress of observers, or some high authority, should issue a clearly-worded set of rules, and that all should yield them implicit obedience.]

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APRIL, 1867.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Date.	Days on which .01 or more fell	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of nights below 32°.
			inches	inches.	in.							
I.	ENGLAND.	Camden Town	2·36	+ 1·23	·43	20	20	66·4	2	30·8	1	1
II.		Staplehurst (Linton Park)	1·67	+ ·45	·27	20	18	62	2, 19	29	1, 12	3
,,		Selborne (The Wakes)	3·21	+ 1·71	·53	20	20	60	19	29	11 ††	2
III.		Hitchen	2·06	+ 1·06	·39	14*	17	62	18‡	32	11	0
,,		Banbury	2·31	+ 1·15	·42	20	22	63	19	28	1	3
,,		Wisbech	2·38	...	·58	20	17	67·5	18	29·2	1	1
IV.		Bury St. Edmunds (Culford)	3·17	+ 2·42	·72	24	18	66	18	28	11	1
V.		Calne	3·25	...	·53	23	19	63	17	27.5	1	3
,,		Plymouth (Goodamoor)	4·67	+ 2.42	...	...	...	...	...	...	...	...
,,		Barnstaple	3·49	+ 1·48	·58	20	19	...	...	...	...	...
,,		Taunton (Fulland's School)	1·83	+ ·29	·48	14	15	...	...	36	28	...
VI.		Shrewsbury (Highfield)	2·44	+ 1·10	·52	21	16	...	...	..	...	..
,,		Tenbury (Orleton)	3·10	+ 1·56	·54	14	26	63·4	2	31	28	2
VII.		Leicester (Wigston)	2·13	+ ·83	·32	21	20	67	18§	30	11	2
,,		West Retford	...	...	..	...	...	...	...	...	...	...
,,		Derby	3·42	+ 1·99	·55	24	19	64	19	32	1	1
VIII.		Manchester	4·32	+ 2·57	·63	20	24	66	29	32·5	12	0
IX.		York	3·11	+ 2·01	1·02	20	24	64	19	33	1	0
,,		Skipton (Arncliffe)	7·79	+ 4·75	1·12	13	19	...	...	...	...	...
X.		North Shields	1·88	+ ·57	·38	30	19	60·5	19	32	1	1
,,		Borrowdale (Seathwaite)	16·92	+10·02	3·56	14	24	...	...	...	...	...
XI.	WALES.	Abercarn	5·03	...	·81	30	13	61	2	36	12	0
,,		Haverfordwest	7·79	+ 5·93	2·60	14	11	62	28	32	22‡‡	0
,,		Rhayader (Cefnfaes)	5·93	+ 4·04	·71	12	27	60	...	31	...	2
,,		Llanberis (R. Victoria Hotel)	9·22	...	1·40	13	24	...	...	...	...	...
XII.	SCOTLAND.	Dumfries	3·36	+ 1·69	·55	23	25	63·5	29	35	29	0
,,		Hawick (Silverbut Hall)	3·52	...	·69	20	21	...	...	...	...	...
XIV.		Ayr (Auchendrane House)	4·75	+ 2·53	·57	22	22	61	23	31	29	1
XV.		Otter House	7·12	+ 4·37	1·45	27	25	59	23‖	35	12	0
XVI.		Leven (Nookton)	2·83	+ 1·59	·59	10	17	59	21	34	17§§	0
,,		Stirling (Deanston)	5·53	+ 3·79	·69	23	26	59	19¶	31	1 ‖‖	5
,,		Logierait	3·21	...	1·11	27	20	...	...	...	...	...
XVII.		Ballater	3·44	...	1·16	27	24	62	19	27·5	5	3
,,		Aberdeen	3·13	...	·71	10	22	61·3	1	31·7	12	1
XVIII		Inverness (Culloden)	2·93	...	·70	11	18	56·1	19	33·5	5	0
,,		Fort William	8·53	...	1·39	13	25	54·5	29	31	12	1
,,		Portree	10·02	+ 4·75	1·80	13	24	58	29	31	12	1
,,		Loch Broom	5·00	...	·55	7	27	...	...	...	...	...
XIX.		Helmsdale	3·09	...	·43	10†	21	...	...	...	...	...
,,		Sandwick	4·20	+ 2·46	·57	27	26	54·1	20	30·5	12	2
XX.	IRELAND.	Cork	3·30	...	·64	29	18	...	...	...	...	...
,,		Waterford	3·03	+ ·80	·60	27	24	...	...	...	...	...
,,		Killaloe	6·43	+ 4·30	·64	7. 28	26	60·5	1**	30	28	1
XXI.		Portarlington	4·33	...	·56	23	26	63	28	39	9	0
,,		Monkstown	2·48	+ ·84	·43	29	25	67·4	23	30·8	28	1
XXII.		Galway	2·88	+ ·86	·48	27	27	57	25	38	22	0
,,		Bunninadden (Doo Castle)	4·86	...	·78	23	26	57·8	5	32	27	0
XXIII		Bawnboy (Owendoon)	6·85	...	·70	10	27	...	...	...	...	...
,,		Waringstown	4·16	...	·65	23	25	66	23	30·5	11	1
,,		Strabane (Leckpatrick)	3·75	...	·54	25	23	62	23	31	28	1

*And 20th. †And 23rd. ‡And 19th. §And 19th. ‖And 24th. ¶And 28th. **And 17th & 19th.
††And 28th. ‡‡And 27th. §§And 28th. ‖‖And 11th and 25th.
+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

LINTON PARK.—A dull, showery month; the latter part mild and growing, T on 9th and 30th. Great progress in vegetation during the last 10 days. Prevailing winds S.W. Cuckoo heard on 18th.

SELBORNE.—H storm on 30th p.m. Bar. max. on 1st, min. on 20th. Prevailing winds from N.W. to S.W.; very high from the 5th to the 21st, with few days intermission. First martin seen on 14th, swallows on 17th, cuckoo heard on 19th.

BANBURY.—High winds on 8th and 13th. H storm at 3 a.m. on 27th. Swallows seen on 17th. Blackthorn in blossom on 18th, crab apple on 27th.

WISBECH.—Gales on 8th, 9th, 11th, 14th, and 21st, averaging more than 16lb. to the square foot. From the 8th to the 21st the weather was very stormy. The warmest days were from the 17th to the 20th, and their influence on vegetation was very marked, blossoms and leaves appearing as if by magic. Plum and cherry in blossom on 16th, pear on 19th, and apple on 27th; hawthorn in leaf on 13th, horse chesnut on 14th, common poplar 15th, lime on 18th, sycamore 20th, field elm 29th, wych elm 30th.

CULFORD.—High winds on 11th, 14th, 20th, and 21st. H storms on 11th, T on 14th. The weather comparatively mild. Swallows first seen on the 17th.

TAUNTON.—Swallows first seen on 10th, cuckoo heard on 23rd.

DERBY.—The incessant rains have greatly interferred with farming operations. The wet autumn prevented the usual seed sowing, and the ground is not yet sufficiently dry for that purpose. Fruit in average forwardness, and more than average promise.

MANCHESTER.—Seventy-three years average gives only 2·00 in., and this year we have had a fall of more than twice as much.

ARNCLIFFE.—Hills white with S on 21st. No swallow observed here till the 23rd, cuckoo heard on 28th. Wet, cold and ungenial.

NORTH SHIELDS.—Fog and TS with H on 24th. Solar Halo on 28th.

SEATHWAITE.—A month with a low temp.; scarce any sunshine, and nearly three times as much R as the average for April.

WALES.

HAVERFORDWEST.—A terrible storm of wind and R on the 14th, when more R fell in 24 hours than is usual in the whole month. The month commenced with fine, dry weather, northerly winds and bracing air. After the 7th the weather became very precarious and cold, with violent storms of wind. A bad seed time; very little frost, but ungenial; vegetation backward.

RHAYADER.—Only three days without R. The month has been very cold and wet, with floods. Prevailing wind N.E. Seed sowing and potatoe planting delayed. Cuckoo heard on 20th, corncrake on 23rd.

SCOTLAND.

DUMFRIES.—The month mild and moist; only three days without R. H on 14th. S on the hills on 21st. Swallows seen on the 11th, cuckoo heard on 14th. —[Nearly a week *earlier* than in the south. ED.]—At the close of the month oats and grass beautiful, and vegetation more forward than usual, owing to the absence of frost.

HAWICK.—The month throughout has been cold, wet, windy, and sunless, with very little frost, but the hills white with S on the morning of the 24th. T on 14th. Swallows first seen on 19th, and cuckoo first heard on 28th.

AUCHENDRANE.—The cold, dry March has been succeeded by a wet warm April, the mean temp. having been 11° higher than that of March. The rainfall this April is more than six times that of April in 1865 or 1866. As April is the principal sowing month in Ayrshire, a wet April is generally followed by a bad crop. Though the rains have retarded and injured the sowing, especially on spring lands, the high temp. has produced early crops in unusual abundance.

OTTER HOUSE.—Owing to an almost continued R, agricultural operations are later (by nearly three weeks) than last year. Vegetation is also late, which

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may be compensated by subsequent fine weather. Swallows were seen flying about during the last week, and the cuckoo was heard on the 27th.

DEANSTON.—From the 1st to 16th very stormy and wet; S on the hills on the 10th; whole month wet, cold, and very backward. On the 30th scarcely any leaves on any of the trees except the hawthorn.

LOGIERAIT.—A cold ungenial month, with a succession of E. winds. Vegetation backward. Swallows seen on 26th, cuckoo heard on 28th.

BALLATER.—The coldest April experienced here for many years. Frequent showers of sleet or S in the early part of the month, the neighbouring hills being covered with a fresh coating of S for several days, and the low grounds white on the evening of the 10th. More or less R fell almost daily, and the ground being thus soaked, the seed sowing was much interrupted.

ABERDEEN.—Fog on seven days. Auroræ on eight days. A very unseasonable month for the crops, characterized by excessive moisture, high mean temp. and low bar. The rainfall 1·17 in. + the average, and was spread over much time, falling principally as drizzle. More W. and N.W. wind than usual.

CULLODEN.—Fog on 6th and 20th. Solar halo on 12th.

FORT WILLIAM.—Very wet during the greater part of the month. R fell daily from the 25th of March to the 23rd of April, both inclusive. The total fall in April was nearly three times the total fall in April, 1865 or 1866. S on hills on 10th.

PORTREE.—Agricultural operations unusually late, the frosts of March and R of April having prevented the seed sowing; much is still unsown, and our prospects here are by no means good.

LOCHBROOM.—The wettest and most unpropitious April within the memory of man; only three dry days in the month. Sowing and planting have been so retarded, that they are a month, and in some cases six weeks, later than usual, but the last few days still give us hopes of a good harvest.

SANDWICK.—This April has been the wettest for 27 years, except 1859, and that was only 0·13 in. more. There was a sprinkling of S on the 12th, and on the hills on the 16th. Aurora noted on 4th and 10th.

IRELAND.

KILLALOE.—Continued storms and showers on the 8th, 9th, and 10th. T S about 8 p.m. on 18th. From 1846 to the present year, only once has the rainfall in April reached 5 in. (1862, 5·05), while this year it is 6·43 in.

MONKSTOWN.—T S with H on 9th; H also on 14th, 21st, and 22nd. S on the higher mountains on 28th; this was also the case on the 1st of May, 1866. Gales on 10th and 15th. R almost every day, which, added to the low temp., has retarded vegetation, and also the sowing of the land much later than usual.

DOO CASTLE.—There had been so little done in the way of spring preparation since the beginning of the year, the farmers looking forward to this month to enable them to make up for past delays, that a month of almost incessant R has been a grievous affair. Even now much of the potatoe land is undug, and all is now hurry and confusion, hay, oats, &c., having nearly doubled in price, in some cases higher than ever known in this neighbourhood. The cattle have a wretched, starved look, and not without reason. I attribute this state of things to the weather, and not to want of forethought. The severe winter consumed almost all the fodder; its continuance pressed heavily on oats and potatoes, which had to be given to cattle instead of cheapening our market at the present time; hence the high prices, and hence men look aghast at our future.

OWENDOON.—The month has been very wet, stormy, and inclement. Almost all the fodder has been exhausted, and much of the land is still uncropped.

WARINGSTOWN.—A very wet month—only five days without R, and farming operations in consequence been retarded beyond precedent, especially in heavy soils (such as that of this district). No potatoes have been planted, and much of the oats and all the flax is still unsown.

LECKPATRICK.—T on 18th and 26th. Cuckoo heard on 23rd. Bar. very unsteady; wind likewise shifting backwards and forwards from N. to S. Very unfavourable month for farmers, the almost incessant R having prevented the seed from being sown till so very late. In the mountains some of the oats are still unsown

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

XVII.] JUNE, 1867. [PRICE FOURPENCE, or 5s. per ann. post free

ANEMOMETERS.

IF any branch of meteorology is in an unsatisfactory condition, it certainly is anemometry—and this, we think, arises from causes not easily removed. In this and following articles we purpose describing the principal instruments now actually used for measuring the movements of the wind; but we think a few prefatory words on the present condition of anemometry necessary to a due application of our subsequent descriptions. The two most serious obstacles to extensive, simultaneous and fruitful anemometrical research are (1) the cost of effective anemometers, and (2) the labour of reducing the records when obtained.

Concerning the first point, information will be given when each instrument is described; but we may premise that any one contemplating the erection of a *complete* anemometer must be prepared to spend £50; possibly opticians may differ from us there; be it so, we shall be glad to find that they are prepared to provide the instrument, transport it to its destination, erect it, and leave it in perfect working order, with recording sheets, forms for tabulating the observations, and all the inevitable et ceteras complete for a less sum; first-class instruments cost from £100 to £200.

The labour of reducing the record sheets to numerical values is also very considerable. It is not, therefore, surprising that there are in various parts of the British Isles stores of anemometrical records for many years past which await, and perhaps will long continue to await, the discussion which they ought to have received. Believing that very much may be done with these old observations, we appeal to all who possess them, and earnestly request them to make arrangements for their publication. And at the outset we would impress on our readers that it is far more useful to have a simple instrument, and thoroughly discuss its indications, than it is to establish an apparatus yielding results which the owner has not time to reduce.

Taking first the simplest form of wind measure, we have that known

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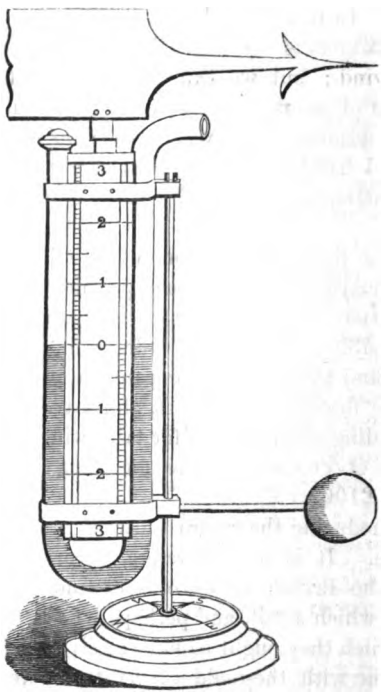
as Lind's anemometer, (fig. 1), invented in 1775, the principle of which is very simple, being merely the measurement of the length of a column of water, which is supported by the direct pressure of the wind. Inspection of the figure will show that the orifice of the tube is kept face to the wind by the vane, and the water, which in a dead calm stands as shown on the diagram at 0, on the wind increasing is depressed in one leg and elevated in the other, the sum of the departures from 0 indicating the length of water column supported by the wind's force. This is readily converted into lbs. pressure per square foot by simply multiplying the weight of a cubic inch of water by 144, and converting into lbs., we then have 5·2 lbs. for each inch, and of course 0·52 lb. for 0·1 inch, 52lbs. for 10 inches, &c.; the unit being as stated, anyone can readily deduce any intermediate point for himself.

Fig. 1.



Some modifications of this instrument were suggested by Sir W. Snow Harris in 1858, the leading features being (1) a bent tube of smaller bore used in the hinder part of the U, whereby an enlarged scale was obtained; (2) an arrangement for closing the hinder part of the tube, so that the reading may be taken off at leisure; (3) the instrument dismounted from the pivot shown in figure 1, and held by the hand towards the wind, of which the direction was shown by a very small

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vane. These modifications contain elements of good. (1) improves its sensitiveness; (2) is perhaps more promptly and thoroughly effected by the pressure of the observer's finger; (3) we think possibly good at sea, but decidedly bad for land observers. The plate accompanying Sir Snow Harris's article (in the *Nautical Magazine* for March, 1858), and from which we know some instruments were constructed, appears wrong, as there is no provision for noting the depression in the front half of the U, and the scale is not contracted to compensate for the error. It was a singular oversight in the first instance, and, so far as we are aware, has hitherto escaped detection.

A few years ago Mr. Forbes, of Culloden, suggested a plan for making this instrument record the maximum between any two observations, viz, by putting in the hinder tube a slip of cardboard, previously steeped in a strong solution of sulphate of iron, the water in the tube having been first impregnated with a few drops of prussiate of potash. On the wind elevating the liquid, the cardboard is permanently coloured a deep blue tint, thus marking the maximum force which has occurred. It might be thought that the record of force would be vitiated by capillary action, but Mr. Forbes says that if suitable cardboard is used the difficulty is quite overcome. By cutting a groove in the pedestal marked with the compass points, and placing in it two small indices, then attaching a slight rod to the revolving part of the instrument, these indices may readily be made to record the directions between which the wind has blown, thus giving from this simple apparatus azimuth and force.

The pedestal foot hitherto supplied should be pierced for three or four screws, and the instrument fixed on a pillar four or five feet at least above the ground.

We think it is also expedient that the scale should be altered, each inch being marked as two inches, and so on; by this means the double reading will be avoided. With these modifications, Lind's anemometer might prove a cheap yet efficient instrument; cheap, because if there was any demand, they could surely be made for three guineas each.

(*To be continued.*)

SEVERE HAILSTORM IN INDIA.

"A CORRESPONDENT of the *Madras Athenæum* at Goommanur,* near Bellary, informs us that very bad weather was recently experienced there. On March 28th a terrific hailstorm swept over the place. All the trees in the neighbourhood were stripped of their foliage, heavy branches were torn down, and many trees torn up by the roots. People's clothes were removed from their backs, and a tent was shivered

* Spelt Goomanoor in this article and Goommanur in the second one; the latter is believed to be correct.

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to rags. The hailstones were as large as cocoa nuts and good-sized mangoes. Some four hundred sheep and twenty head of cattle were killed, as were also several human beings, a large number of whom were severely hurt. Thirty hours after the storm, hailstones were picked up in some of the railway cuttings the size of fowls' eggs."—*Homeward Mail, May 22nd*, 1867.

"In the early part of April the collector of the Kistna district reported to Government that on the evening of March 27, there occurred a storm of wind, accompanied by rain and hail, at the village of Goveravaram, in the Nandigama talook in this district. The hailstones were as big as limes. They continued to fall for about a quarter of an hour, and lay on the ground to the depth of a span. Men and cattle were reported to have been severely bruised by the hailstones, which remained in heaps unmelted till nine o'clock a.m. the next day. The collector of Bellary also reports that on the afternoon and night of March 28 and 29, a very severe hailstorm passed over this district. 'In Adoni to the north of the talook, at Nukkulmittah and other villages, the hail is described as being of the size from cocoa nuts to woodapples, and lying to one foot in depth; in some places destroying the wet and dry crops. In Gooty, at eight p.m. on the 28th, the hail was described as ranging from the size of bullets to limes; some sheep were killed and crops destroyed. The villages indicated are Hunchinbal, Karakamookkala, and Konacondla. In Anantapur talook the size of the hailstones is apparently incredible. I give, however, the local report, that in a field of the village of Bondalavada some of the stones were two-thirds of a cubic yard in size. In the village of Chadula a cubic span, and in other villages of six seers, or three pounds weight; this last was verified by the Tahsildar. Two men, 2,470 sheep, and eight cattle were killed, and some thatched houses were destroyed. In Alur, on March 28 and 29, to south of the talook, at Goommanur and other ten or twelve villages, the hail was described as ranging from the size of cocoa nuts to mangoes, and lying half a yard in depth in some villages, destroying the dry crops, two men were killed, and one was carried away by the flood in a nullah close to Goommanur. Looking from the talook of Hospett on that evening, a vast pile of electric clouds was seen towards the east, similar to those which collect on the western coast before the commencement of the monsoon. I have had no intelligence of hailstorms in the western talooks, or from those furthest south, so that as far as I am at present informed, the storm must have extended over the north, centre, and south-east of the district. When further details are received regarding the loss of crops a report will be made, if any, and what consideration should be shown to the sufferers.' The collector of Cuddapah reports that a severe storm, accompanied by hailstones of extraordinary size, was experienced in different villages of the three talooks, Pulivendala, Royachoty, and Kadiri. 'In the Pulivendala talook seven individuals received serious wounds and lost their lives. The storm in the other villages swept away the standing crops and stacks, and also killed some sheep."—*Homeward Mail, June 4th*, 1867.

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REVIEWS.

A Handy Book of Meteorology, by ALEXANDER BUCHAN, M.A., Secretary of the Scottish Meteorological Society. W. Blackwood and Sons. Small 8vo, 204 pages.

A VERY handy book this, for in its small compass Mr. Buchan has stored more and later information than exists in any volume with which we are acquainted. Yet it is a tantalising book, for occasionally trains of thought are started, pursued with considerable skill, and then dropped suddenly, instead of being pushed to their legitimate conclusions. The old saying that a great book was a great evil we do not accept, and look forward to the day when some one shall publish not a handy book, but a standard work of reference, detailing the steps by which meteorology has been raised to its present position in this and other countries, and pointing out (as Professor Forbes did 30 years ago) the principal subjects requiring investigation. This is not a matter to be lightly taken up, but the condensation of information which repeatedly struck us when perusing this Handy Book, convinced us that, whether or not Mr. Buchan may be inclined to attempt the more serious labour we have indicated, whosoever does undertake it, will do well to keep Mr. Buchan's book and its capital index at his elbow.

We wish authors would be a little more careful in spelling proper names. The last work we noticed was very guilty in this respect, and Mr. Buchan's is just as bad. We do not mind trifling variations, such as Trivandrum for Trevandrum, but who would recognise "Sakoutsh in Siberia," (page 71) as the same as "Yakutsk," (page 76); then we have one of Mr. Buchan's best observers repeatedly at Sandwich instead of Sandwick; and in one line we have Philip's instead of Phillips's, and Nigretti instead of Negretti.

We can hardly give a fairer specimen of the style of the work than by the following quotation on a subject which (though often discussed among observers) has not, we believe, been treated of in any previous publication :—

Mean Temperature deduced from Maximum and Minimum Temperatures.—Of late years, since the invention of self-registering thermometers, the mean temperature has been more commonly deduced from observations of the highest and lowest daily temperatures. How far does the mean of these two represent the mean temperature? To answer this question, I have compared the mean temperature deduced from hourly observations with the mean temperature of the daily extremes at 27 places in different parts of the globe. On an average of six months of the year, the difference between the two does not exceed the third of a degree; the difference for any month seldom exceeds a degree, and the mean annual difference seldom more than half a degree. At Rio Janeiro the difference for any month does not amount to 0°·3, whereas at Catherinenburg, in the Ural Mountains, it exceeds this amount in every month but one. In some places the differences are all in excess, in others they are all in defect; in some places an excess occurs in winter and a defect in summer, and in other places *vice versâ*. In most places the great difference is in October and November, but in a few places the reverse holds good.

Comparing the Leith and Greenwich observations, we find that the mean annual deviation at Leith is 0°·2, at Greenwich 0°·7; the lowest monthly deviation at Leith 0°·1, and at Greenwich 0°·2; and the highest at Leith 0°·6, and at Greenwich 1°·1. It would appear that these differences are dependent almost entirely on local peculiarities, such as the open or confined situation of the thermometers,

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the covering of the ground over which they are placed, the protection from radiation, and the degree of freeness with which the air circulates around them.

At the stations in connection with the Scottish Meteorological Society, the mean of the daily extremes is accepted as the mean temperature, and most meteorologists now adopt the same mean. Others, however, apply to this mean a correction, in order to bring it to what is conceived to be the true mean temperature. This is a practice which, for many reasons, ought to be discouraged. The mean of the daily extremes gives observation alone, whereas the "corrected" means are vitiated by misleading hypotheses. If an observer in the North of England gives the "corrected" mean temperature of August, 1865, as 57°·3, what does this mean? If he has adopted the Greenwich correction for that month, the observed mean was 58°·2, but if the Leith correction, it was 57°·4. If two observers near each other should use the one the Leith correction, and the other the Greenwich, a difference in the climates of the two places would be indicated, which has in reality no existence.

Since penning the above remarks and extract, we have been comparing the numerical values with those given in Mr. Glaisher's Diurnal Range Tables (Taylor and Francis, 1850), the result being that we feel quite puzzled, and must appeal to Mr. Buchan for elucidation. The Greenwich table being a very short one, we quote it verbatim from the 1850 edition :—

"TABLE VIII.

"*Showing the corrections to be applied subtractively to the simple arithmetical mean of the readings of the maximum and minimum thermometers, to deduce from them the mean temperature of the air.*

January.....	0·2	May.....	1·7	September...	1·3
February ...	0·4	June	1·8	October.....	1·0
March	1·0	July.....	1·9	November...	0·4
April.....	1·5	August ...	1·7	December ...	0·0"

The mean of these numbers is 1·1, instead of 0·7, the lowest is 0·0 instead of 0·2, the highest 1·9 instead of 1·1, and August is 1·7 instead of 0·9. Perhaps Mr. Buchan has taken his values from some later publication; if so, we believe our readers will be as glad as we shall, to be supplied with the correct values. When this is cleared up, we may offer a few remarks on the question, which, in spite of the above-mentioned puzzle, we believe Mr. Buchan has ably investigated.

Meteorological Report and Climatological Tables for 1866, Edited by the Rev. R. F. WHEELER, M.A. 8vo, 26 pages. [*Extract from the Natural History Transactions of Northumberland and Durham.*]

AN able and interesting summary of the principal phenomena of the year, with tables of pressure, temperature, and rain, natural history calendar, &c. Among the notes on the meteor shower of November 13th-14th, 1866, is the following, by the Rev. R. E. Hooppell, M.A., of the Marine School, South Shields :—

"Immediately after the great shower of meteors a remarkable fall in the temperature took place. At Burghfield Grange [Gateshead] the average daily maximum for the seven days immediately preceding, had been 51½°, and the average daily minimum 36°. For the seven days immediately succeeding the shower the average daily maximum was only 44°, and the average daily minimum 31°. For the next seven days the average daily maximum and minimum rose again, being respectively 47° and 39½°. This remarkable diminution was very extensively observed. The Astronomer Royal's report, from the Cape of Good Hope, shows that it occurred there also, which is the more noticeable, as the season there would be approaching summer, and the temperature would be naturally increasing, not diminishing, from day to day."

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Meteorological Observations on the Humidity of the Air of Scarborough, with Chapters on Rain, Rain Gauges, and Rainfall Investigations, and on the Humidity of the Atmosphere in relation to Disease, by CORNELIUS B. FOX, M.D. &c. Simpkin and Co. Small 8vo, vi.-40 pages. Profits arising from its sale to be devoted to the Scarborough Village Hospital.

IN this little book both author and publisher have done their best, and their best is very near perfection. It is a capital little monograph, free from favouritism, that bane of local works on climate. It is just to the beautiful Queen of British Watering Places, but it is no more than just. We only see one way in which it could have been improved, (and perhaps all would not think it an improvement,) namely, by the insertion of a table, giving the monthly and annual fall of rain at Scarborough so far as records have been preserved, instead of giving merely abstracts thereof.

Dr. Fox has done his work well, and we earnestly hope the sale of this cheap little pamphlet will equal its merits, then (though the price is but ninepence!) the Scarborough Village Hospital will reap profits even beyond Dr. Fox's anticipations.

ENTRY OF MINIMUM TEMPERATURES.

To the Editor of the Meteorological Magazine.

SIR,—It will be obvious to anyone who examines the returns published in your Magazine that considerable diversity of practice exists among observers in entering the minimum temperature. For example, in the returns for April, at several places the minimum is recorded as occurring on the 1st, *i.e.*, the night March 31st–April 1st; at other places not very remote it is set down to the 11th, *i.e.*, the night April 11th–12th (the nights April 1st–2nd and 10th–11th were neither of them frosty).

I have been in the practice of entering the minimum to the preceding day, considering that by the night of 11th April would be popularly understood the night following that day. The astronomical reckoning from noon to noon is also in favour of this practice, but uniformity is so desirable that the minority should give way to the majority as soon as it can be ascertained which plan is generally adopted. Can you not obtain a general report, and settle this question?—Yours respectfully,

J. ALEXANDER.

Sudbury, *May* 31*st*, 1867.

[So far as we are at present aware, the practice of the Meteorological Society and the Scottish Meteorological Society is identical. The instructions of the former are:

"The maximum temperature usually takes place during the early afternoon hours, and whether the reading be taken after this time on the same day, or early on the next day, it must be entered opposite to the day to which it belongs—that is, on the same day as read, if taken late on the one day, or on the preceding when taken early on the morning of the following day. The minimum temperature usually takes place early in the morning, and the minimum read in the morning is generally the minimum for that day, and is to be so entered."

The Scottish Meteorological Society direct that—

"The self-registering thermometers are to be read at 9 p.m. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering thermometers are read, since, in winter at least, the extremes may occur at any hour, and it is necessary to refer their occurrence to their proper meteorological *day*. In the Society's schedules the indications registered on the 3rd are those of a series of phenomena commencing at 9 p.m. on 2nd, and extending till 9 p.m. on 3rd."

Thus both are in strict accord, and we think the sooner all observers unite in complying with these instructions the better.]—ED.

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RAINFALL AT CARDIFF.

SIR,—Just before your notice of Col. Capper's book on Meteorology, I had perused that work, and copied out the rainfall table to send to you. That table is not to be relied on as an accurate account of the rainfall in this district, the true quantity being very nearly double the colonel's measurement. There is no reason to suppose that the rainfall here has diminished, so I can only attribute the deficiency to imperfection in the colonel's rain gauge. This seems to me to raise a doubt as to the correctness of old records of rainfall, in the absence of any information stating the kind of gauge employed in taking the observations. This is especially the case when the register differs very widely from more modern measurements.—Yours faithfully, FRANKLEN G. EVANS.

Tynant, Pentyrch, *June 3rd*, 1867.

[In reply to this note, we will first explain that as a rule we do not use old observations for determining the mean rainfall of the locality at which they were taken. We collect them with every care, test their accuracy as far as possible, and preserve them most securely, because they are our best and only guide to what may be termed secular rainfall variations—that is to say, the relation of each year to the mean of a series of years. In this respect it is obvious that if a gauge was so absurdly incorrect as always to indicate double the fall which actually occurred, it would not cause the least error in the ratio of fall in different years.

With reference to the case in point, we prefaced the insertion of the table by the following words, (*Meteorological Magazine*, Vol. II., p. 45) :—"Of the size or position of the gauge nothing is said ; from the amount we infer it must have been on a roof or wall." The letter of so careful an observer as Mr. Evans has induced us to examine the matter closely, with the following results :—

The rainfall in the years 1800-1807, we find from a table printed (but not yet published) in the forthcoming British Association Report, was 12 per cent. below the mean of the last 50 years. The observed amount being 23·76, the addition of this 12 per cent. only raises it to 26·61, which is certainly very different from the true fall, which is about 40 inches. A deficiency of one-third is therefore apparent, being the same deficiency as that found on the roof of Mr. Washington Moon's house in the Finchley-road, (*British Rainfall*, 1866, p. 27), thus supporting our suggestion that the gauge may have been on a roof. Unfortunately we have at present no records from the south-west of England or from Wales complete for these 8 years ; we have therefore been compelled to fall back on distant stations for the formation of the following table :—

Rainfall in England, 1800 *to* 1807.

STATIONS.	1800	1801	1802	1803	1804	1805	1806	1807	Mean of 8 yrs.
	in.	in.	in.	in.	in.	in.	in.	in.	in.
Chatsworth	27·73	28·35	23·34	24·27	27·90	22·23	30·08	26·87	26·28
Ferriby, Hull ...	29·50	26·25	28·92	26·25	26·50	24·50	30·87	27·00	26·85
Kendal	48·25	50·50	51·73	40·50	47·25	42·75	53·89	53·00	48·48
Lancaster	35·93	44·63	47·46	34·75	35·62	33·52	40·72	37·01	38·71
Manchester	32·34	35·05	35·74	27·47	29·31	27·54	33·49	35·50	32·06
Nottingham	27·00	26·50	21·00	17·00	23·50	22·12	25·56	23·93	23·25
Mean, 6 Stations	33·46	35·21	33·87	28·37	31·68	28·78	35·77	33·70	32·01
Cardiff	26·82	24·10	22·77	20·59	27·01	20·28	27·80	20·68	23·76
Ratio { 6 Stations	103	108	104	87	97	88	110	103	100
Ratio { Cardiff ...	113	101	96	87	114	85	117	87	100

Considering the distance of Cardiff from even the nearest of these stations, we think the fluctuations as favourable to Colonel Capper's accuracy as could be expected.]—ED.

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MEASUREMENT OF SNOW.

To the Editor of the Meteorological Magazine.

Sir,—The following method for obtaining the equivalent volume of rain and snow might be advantageously adopted. Fill a tumbler with loose snow, which would be best done by placing the tumbler where a snow-drift is likely to occur, weigh the tumbler thus filled. Now fill with water and weigh again; subtract the weight of the tumbler in each case. Divide the weight of snow by the weight of water. A modulus will thus be obtained, by which if any given volume of snow is multiplied its equivalent in water will be found.—I am, yours obediently,

J. S. W.

[J. S. W. is quite right in recommending us to weigh the snow instead of evaporating 10 per cent. in our attempts to melt it.]—Ed.

METEOROLOGICAL PERIODS.

To the Editor of the Meteorological Magazine.

Sir,—I was faithless about the 29 years return of the same seasons until I read to the end of the statement of your correspondent, when it appears wonderful how similar *many* of the years are, and *dissimilar some*. But your correspondent does not give us 1838 to guide us as to this year of 1867; if there is any truth in it, there would be some use in being forewarned. I see, however, what 1809 was, which is 58 years ago, which was a fickle summer but a very hot May, and we may say there is some similarity thus far, for one week in May was very hot, thermometer 85° on the Monday.—I remain, Sir, yours truly,

Cambridge, *May 22nd*, 1867. J. NUTTER.

A SHOWER OF HAZEL NUTS!

To the Editor of the Meteorological Magazine.

Sir,—I enclose you two extracts from one of our Dublin papers relative to some berries, which are reported to have fallen in large quantities in some parts of Dublin on the night of Thursday, 9th May. I have been given two of these berries; they are in the form of a very small orange, about half an inch in diameter, black in colour, and, when cut across, seem as if made of some hard dark brown wood. They also possess a slight aromatic odour.

Various speculations have been given forth as to their origin, but none of them seem to be worth much. If you think the extracts herein, worthy of a place in your Magazine you can insert them.—Yours very truly, ARTHUR PIM.

Monkstown, Dublin, *June 1st*, 1867.

THE SHOWER OF BERRIES.

To the Editor of the Daily Express.

Sir,—I have been daily expecting to see some notice of the strange phenomenon which took place during the tremendous rain-fall of Thursday night. None having appeared in any of the journals, I hope, through your columns, the public may learn to what cause we are to attribute the shower of aromatic smelling berries which fell over Dublin (and, possibly, other parts) on Thursday night.

Both on the north and south sides of the river these berries fell in great quantities and with great force, some being larger than the ordinary Spanish nut.

Numbers of these strange visitors were picked up in Capel-street, in Dame-street, and Bishop-street, and I am informed that so violent was the force with which they descended that even the police, protected by unusually strong head covering, were obliged to seek shelter from the aërial fusilade!—Yours truly,

T.C.D., *May 13th*, 1867. Rusticus Expectans.

Inquirer, who has sent us some "small balls," which he says "fell in large quantities on Thursday night," locality not specified, is informed that they are simply hazel nuts, preserved in a bog for centuries. How they came to descend on him we cannot say.

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MAY, 1867.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth	Date.	Days on which .01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of nights below 32°.
		inches	inches.	in.							
I.	ENGLAND. Camden Town	2·45	+ ·05	1·03	20	9	84	6	31·8	23	1
II.	Staplehurst (Linton Park)	2·35	— ·11	·59	11	12	85	7	29	23‡	5
,,	Selborne (The Wakes)	1·66	— ·81	·40	25	12	77	6	25	4	6
III.	Hitchen	3·03	+ ·55	1·13	10	11	75	6, 8	30	22§	3
,,	Banbury	3·02	+ ·80	·83	10	10	79	8	29·7	23	4
,,	Wisbech	3·51	...	1·62	10	9	84	6	32·3	23	0
IV.	Bury St. Edmunds (Culford)	2·65	+ ·49	1·14	12	10	80	6	27	24	3
V.	Calne	1·80	...	·49	20	9	79·5	8	28·8	25	3
,,	Plymouth (Goodamoor)	...	...	...	...	...	...	...	...	...	...
,,	Barnstaple	2·63	+ ·20	·35	11	13	...	...	...	...	...
,,	Taunton (Fulland's School)	2·88	+ ·83	·65	13	14	89·5	30	33	17	0
VI.	Shrewsbury (Highfield)	2·73	+ ·13	·72	12	11	...	...	...	...	...
,,	Tenbury (Orleton)	2·25	— ·64	·52	25	13	78·7	8	31·4	25	2
VII.	Leicester (Wigston)	2·02	— ·46	1·02	11	10	85	8	27	23	3
,,	West Retford	...	...	..	...	...	...	...	...	...	...
,,	Derby	1·73	— ·43	·56	10	11	78	8	33	17	1
VIII.	Manchester	1·95	— ·71	·38	27	9	76	5, 6	32	23‖	0
IX.	York	1·78	— ·17	·43	26	17	71	9, 30	33	23	0
,,	Skipton (Arncliffe)	2·42	— ·93	·40	11	12	69	30	32	23	0
X.	North Shields	2·32	— ·32	·84	11	15	...	...	...	...	...
,,	Borrowdale (Seathwaite)	5·25	— 4·29	·94	18*	14	...	...	...	...	...
XI.	WALES. Abercarn	4·70	...	·93	13	13	72	9	36	23¶	0
,,	Haverfordwest	4·15	+ 1·43	·84	21	14	74	8	31·9	22	1
,,	Rhayader (Cefnfaes)	...	...	...	...	..	...	...	...	...	...
,,	Llanberis (R. Victoria Hotel)	2·44	...	·91	25	11	...	...	...	...	...
XII.	SCOTLAND. Dumfries	2·85	+ ·46	·43	11	15	73	8	31·5	25	1
,,	Hawick (Silverbut Hall)	2·46	...	·60	26	17	...	...	...	...	2
XIV.	Ayr (Auchendrane House)	1·51	— 1·60	·42	11	13	74	8, 31	28	22	2
XV.	Otter House	1·67	— 2·07	·31	10	12	66	8, 30	32	22	1
XVI.	Leven (Nookton)	4·47	+ 2·47	1·08	26	15	64	6	33·4	14	0
,,	Stirling (Deanston)	3·89	+ 1·24	·89	11	17	69	30	30·3	23	3
,,	Logierait	2·82	...	·63	11	16	...	...	...	...	...
XVII.	Ballater	2·54	...	·10	11	18	66·5	6	29	26	3
,,	Aberdeen	2·68	...	1·15	11	18	67·3	7	32·7	14	0
XVIII	Inverness (Culloden)	1·59	...	·40	17	12	64·6	6	33·6	26	0
,,	Fort William	2·01	...	·40	31	16	67	8	32	23	...
,,	Portree	3·08	— 2·57	·65	16	13	76·5	27	31·8	23	1
,,	Loch Broom	1·91	...	·57	16	14	...	...	...	...	...
XIX.	Helmsdale	2·18	...	·54	11	17	...	...	...	...	...
,,	Sandwick	1·11	— 1·15	·21	4	12	...	...	...	...	...
XX.	IRELAND. Cork	5·37	...	1·45	25	20	...	...	...	...	...
,,	Waterford	5·19	+ 2·94	1·55	26	21	67	29	39	16**	0
,,	Killaloe	3·45	+ .27	·61	10	15	70	19	29·5	23	1
XXI.	Portarlington	3·56	+ ·37	·76	11	18	69	9	31	22	1
,,	Monkstown	3·07	+ 1·17	·75	10	14	68·5	3, 12	32·5	23	0
XXII.	Galway	4·67	...	·99	12	19	73	23	40	12††	0
,,	Bunninadden (Doo Castle)	4·62	...	·70	10	18	66	30	28	23	2
XXIII	Bawnboy (Owendoon)	4·94	...	·75	10	20	...	...	...	...	...
,,	Waringstown	2·93	...	·59	16	13	73	30	28	22	2
,,	Strabane (Leckpatrick)	3·12	...	·49	10	14	68	8†	31	23	1

*And 27th. †And 9th & 30th. ‡And 24th. §And 23rd & 24th. ‖And 24th. ¶And 24th.
**And 23rd. ††And 14th.

+ Shows that the fall was above the average; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

LINTON PARK.—T on 10th, 11th, and 29th; frost on 17th, 22nd, 23rd, 24th, and 25th. Altogether a very remarkable month; very hot from 4th to 11th, while from the 20th to 26th it was very cold; S falling in sufficient quantities on the 23rd to cover the ground, and the frosts very destructive to vegetation; the last few days more mild.

SELBORNE.—Rapid advance in vegetation during the first part of the month, but the effects of the frosts of the 23rd to 25th, inclusive, were most disastrous, potatoes, french beans, and dahlias destroyed, young leaves of ash, walnut, and oak blackened as if burnt, gooseberries and currants as if parboiled; the cold for those four days has not been equalled in May within my memory. T with H on 10th.

HITCHEN.—On the 10th a storm almost equal to the famous one of July 7th, 1865.

BANBURY.—L on 9th, and violent T S on 10th; balls of S and H on 22nd. Lilac in flower on 4th, hawthorn on 6th.

WISBECH.—Heavy T S with very vivid L on 10th; ground covered with H on 22nd. Walnut in leaf on 3rd, oak on 6th, lilac in bloom on 3rd, laburnam on 8th, honeysuckle 9th, mountain ash 13th, syringa on 27th.

CULFORD.—The weather during the month has been of a most extraordinary character; up to the 12th day the temp. was almost tropical, when a most remarkable change took place. Sharp frost on the night of the 16th, but most severe from the 21st to the 25th; great injury to crops; shoots of oak, ash, walnuts, &c. blackened, garden vegetables injured, some destroyed, and tender flowers killed.

CALNE.—Swifts arrived on 6th; downs white with S on 22nd.

TAUNTON.—L at 10.30 p.m. on 9th, and heavy T at noon on 10th. Hot at the beginning and end of the month, but so cold in the middle as to retard vegetation for about a fortnight.

SHREWSBURY.—H storms on 22nd.

WIGSTON.—This month will be memorable for the very unusual range of temp., being 58°; the heat at the end of the month more than compensated for the coldness previous to the 25th, the mean of the month being above the average for May. Vegetation forward except corn; slight S showers on 22nd and 23rd.

DERBY.—May opened at a summer heat, then relapsed into winter, the ground frosts on several nights having injured the young potatoes and kidney beans, though at 5 feet from the ground the ther. never registered less than 33°, and that only on one night.

ARNCLIFFE.—S on 22nd.

NORTH SHIELDS.—T SS on 6th, 10th, and 28th; S on 15th, 23rd, and 24th; H on 13th, 14th, 21st, and 22nd.

SEATHWAITE.—Dry month, no day on which 1·00 in. of R fell.

WALES.

ABERCARN.—A cold ungenial month, with a prevalence of N. and E. winds till the 26th; a blighting hoar frost on the 24th. Alternations of heat and cold very sudden.

HAVERFORDWEST.—First week spring-like, and some days quite summerish, after which it was wet, cold, and stormy. Such a May cannot be remembered.

SCOTLAND.

DUMFRIES.—First ten days warm with much T and R; from 12th to 26th cold northerly winds with occasional frosts; from 26th to close, warm during the days with copious R at night. Extraordinary T SS on 6th and 8th; heavy H on 8th; S on 22nd and 26th. Vegetation checked for a fortnight in the middle of the month, but at the close great progress, with abundance of sunshine and showers; hawthorn in blossom on 19th; early potatoes injured by the frosts on 22nd & 25th.

SILVERBUT HALL, HAWICK.—T on 6th 8th and 22nd; H and S on 13th, 21st, 22nd, 23rd, and 24th; hard frost on 24th. The swallows have nearly all disappeared from this district; landrail heard on 17th.

AUCHENDRANE HOUSE.—This has been a month of very small rainfall, strong

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evaporation, and most unseasonable extremes of temp. By the exposed black bulb on short grass the highest *day* temps. were on the 2nd, 14th, 22nd, 23rd, 24th and 25th, being 99°, 95°, 96°, 102°, 92°, 98° respectively, and the lowest night temps. were 33°, 30°, 26°, 24°, 32°, and 28° respectively. The destruction to early vegetation has been excessive, and even the trees have suffered, particularly in low situations; no S in this district.

OTTER HOUSE.—R much below the average. Rather a cold and ungenial month; easterly winds prevailing, and the thermometer ranging from 32° to 66°; at the end of month beautiful summer weather, and the crops looking well.

NOOKTON.—Cold and ungenial month.

DEANSTON.—Except on four days during the month, easterly winds have prevailed; these were very cold and occasionally very strong. All vegetation very backward; at the end of the month the hawthorn blossom not out, and lilac and laburnam only coming out.

LOGIERAIT.—A few fine days at commencement; cold E. winds from 12th to 27th, which greatly retarded vegetation; closing week more genial. Corncrake heard on 12th.

BALLATER.—The weather of the past month has been stormy and disagreeable; prevailing wind easterly, checking vegetation; on the 12th, 14th, and 22nd, the hills were white with S; grass and oats continue to look well in this quarter, but things generally are three weeks later than usual; H and S on 22nd.

ABERDEEN.—Ground white with S on 22nd; a month of ungenial weather, with little wind; 22 days from N.E., E., and S.E., and much fog. Bar. rather above average. Mean temp. nearly 3° below the mean of last 10 years; rainfall above the average of same period.

FORT WILLIAM.—Greater part of the month cold and ungenial, but less so probably than in England; there was S on the hills on the 16th, but none on the low ground; the total fall of R was about equal to the corresponding month last year, and less than half that of May, 1865.

PORTREE.—This month very cold, more than the usual amount of N.E. wind; frost under the average for this month. Grass is making wonderful progress; cattle much improved in condition. Solar halo on the 24th. No gales during the month.

LOCHBROOM.—This month may be considered dry, but very cold for May. Vegetation of every kind is remarkably late, and the rest of the season must be unusually favourable, or the harvest will be both late and scanty; the last two days give promise of better things.

SANDWICK.—Auroræ on 1st and 2nd; cold E. winds on 22 days; mean temp. the lowest since 1855.

IRELAND.

MONKSTOWN.—A very variable month, commencing warm, very cold during part of the latter half, and closing warm and seasonable. The crops and vegetation have been considerably retarded by the cold, but no serious damage to them has taken place, the cold not having been nearly so severe as in England. On 29th the dry bulb stood at 64°·7, and the wet at 57°·5, showing a difference of 7°·2.

DOO CASTLE.—Large breadth of oats sown here at the beginning of the month, and, with regard to the state of the soil for the reception of the grain, without any visible advantage to compensate for the long delay. A wet month, except from 18th to 25th, when we had cold, piercing E. winds, and dark sunless days, which, as the farmers about here say, put everything back again into the ground. All descriptions of farming operations behind hand; frost on 22nd and 23rd which injured potatoe-tops, particularly in moory and boggy land; more than 100 sheep have died in the adjoining county from the effects of cold after being shorn.

OWENDOON.—S on mountains on 12th; T S on 27th; potatoes injured on 22nd.

WARINGSTOWN.—The early part of the month was cold, with harsh winds and bright sun; the heavy rainfall from the 25th to the 29th softened the air, and the rest of the month was genial.

LECKPATRICK.—Fine till the 9th, then a succession of R and cold easterly winds retarded all agricultural progress; only one frosty night, but cherries, gooseberries and pears injured by the cold, and the crop will be deficient. Potatoe planting very late; turnips sown last week.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

XVIII.] JULY, 1867. [PRICE FOURPENCE. or5s. per ann. post free.

ANEMOMETERS.

(*Continued from page* 53.)

THE next instrument requiring notice, and the one by far most frequently used, is Robinson's Hemispherical Cup Anemometer, the notice of which in Admiral Fitz Roy's *Weather Book* is so thoroughly to the point, that we can hardly do better than quote it :—

"Wind-gauges have been tried ; that by Lind—also a modification of it by Sir W. Snow Harris—and the well-known pressure plate ; but these seem to yield only partial, if not equivocal results. The beautiful cup and dial anemometer (due to Robinson chiefly, if in some degree suggested by Beaufort or Edgeworth,) is more approved, after having been tried experimentally through several years of exposure. * * * * *

"Dr. Robinson showed (in the Transactions of the Royal Irish Academy) that a current of air is opposed by a concave hemisphere, one-fourth more than by a convex one of the same size. Thence experimental trials and mathematical reasoning induced him to adopt the arrangement now general, namely, four hemispherical cups, on horizontal arms, revolving on a friction rollered axis, at a known proportional rate, one-third slower than the passage of air or wind current. Hence velocity, and, from it, pressure, are readily calculated."

Two modes of indicating the number of revolutions made by the cups have prevailed. The first consisted of an endless screw on the axis working into the right hand of a train of 5 dials, each of which revolved ten times for one revolution of the next to the left, the dial next the endless screw showing 10 revolutions, the next showed 100, then 1,000, 10,000, and lastly 100,000. The reading was, therefore, taken as in a gas meter, from left to right, the figures being noted down as read off, it being remembered that if the index points *between* two figures, the lesser of the two is to be taken. To take an imaginary case :—At 9 a.m, June 17th, the hands (counting from left to right) pointed to 176,420, and at the same hour on the 18th they read 297,340; then 297,340—176,420 = 120,920 has been the number of revolutions in the 24 hours. The dimensions of these instruments are understood to be such that the circle described by the centre of each cup is $\frac{1}{1500}$ of a mile—the amount of wind requisite to produce this being $\frac{1}{500}$ of a mile ; 500 revolutions equal one mile. Therefore ($\frac{120920}{500}$ = 241·84

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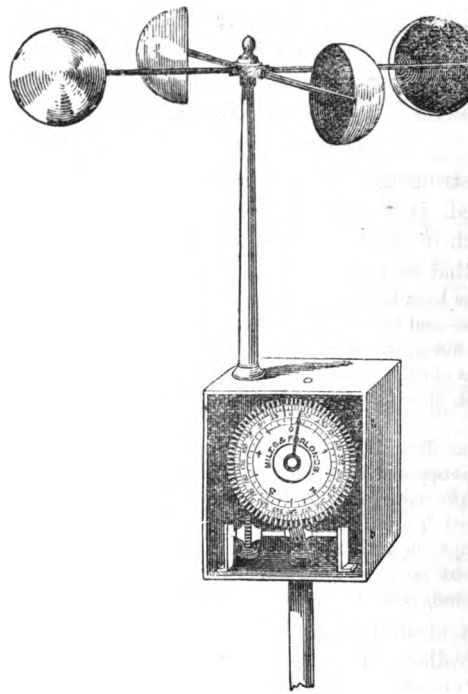
miles) in the case supposed, about 242 miles of wind had passed in the course of the day, that is to say, just 10 miles an hour. It is almost needless to point out that if the three left hand dials alone are read, (for example as above, 176 and 297, then 297 — 176 = 121,) and the result doubled, it gives at once the miles passed 121 × 2 = 242 miles.

Fig. 3.



To Mr. Casella, we believe, is due the improved mode of indicating shown in fig. 2, whereby one dial is substituted for five, and the record is read off in miles at sight. Two further improvements on fig. 2 have since been adopted, so that the record is now read off in miles and tenths, instead of miles and furlongs as shown; and secondly, by the adding another dial, it is made available for examination at long intervals. Another modification was introduced by Messrs. Negretti and Zambra, in which the registering wheels could be disconnected from the cups, and wear and tear thus avoided. Of course by this modification continuous records are not obtained. The price of these instruments ranges from £3 to £5.

Position desirable for Anemometers.—This all important, yet utterly neglected matter, may be advantageously considered before we proceed

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to notice the more expensive class of anemometers. The only instructions we can find are, "It should be fixed in an exposed situation, as high above the ground as may be convenient for reading."* "When in use, it may be screwed on a shaft or ordinary piece of gas pipe, which accompanies it, and elevated to any desirable altitude."† In the instructions of the Scottish Meteorological Society, it is stated that "A wind vane ought to be elevated 12 ft. at least above surrounding objects;" but though "the Council would strongly recommend that every observatory be furnished with a Hemispherical Cup Anemometer," they do not say where it should be fixed.

In this recommendation of the cup anemometer for *general* use, we fully concur, and would gladly render all the aid in our power if some one with leisure volunteers as superintendent of an Amateur Anemometrical Association. We are certain that good results are within reach, but some preliminaries must first be attended to. Of these the most important are—(1) testing the anemometers, and (2) taking observations for a few months with several instruments differently placed, but near together. The desirability (not to say necessity) of testing the instruments is so obvious, that it is unnecessary to dwell upon it. We trust that some steps will be taken to provide this security at a reasonable charge—say five shillings; and we would recommend that observers already provided with anemometers should send theirs to be tested, so that all might start fair.

We think the second preliminary indispensable, for the confusion and irregularity in the location of anemometers can only be realized by those who have visited a considerable number of observers. Let us jot down a few as examples. A has his anemometer on a pole 6 ft. above ground, while B has his on a pole 10 ft. above ground, and has a pair of steps to enable him to read it; C has it on a sentry box 12 ft. high, and with steps up the side; D goes higher still, having a stout pole 20 ft. high, with cross bars, up which he climbs like a bear; E being perhaps too stout for this performance, mounts his among the chimney pots on the top of his house, where the anemometer and himself get sadly begrimed; F has a long rod to bring the registration in doors, while G has an elaborate electrical arrangement whereby the motion of the cups on a distant hill is registered in his library. Surely the time has come when such differences should be swept away. What reliance can we place on records from instruments so variously circumstanced? Experiment alone can give us the relative motion

* Negretti's Treatise on Meteorological Instruments, p. 121.

† Casella's Catalogue, p. 29.

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recorded at different heights above the surface of the ground. These, however, would be very easy to conduct and discuss; the expense would probably be about £20 or £30. We conceive that an open, level station should be selected, and anemometers placed with their cups 10, 20, and 30 ft. above the ground mounted on poles, or better still, on ladders steadied by guys—not that the observer need climb daily to the top (for he can easily read them with a telescope), but that access may be practicable for oiling, &c., when necessary. One should also be placed on the roof of the house, that we may learn the amount of motion due to such a position. Without forestalling the results of the investigation (if taken up), we may record our impression that such positions always register much in excess of the truth.

(To be continued.)

Abstracts of Meteorological Works. No II.

PUBLISHED A.D. 1783.

Essais sur l'Hygrométrie. Par Horace-Bénédict de Saussure, Professeur de Philosophie à Geneve. Neuchatel, Samuel Fauche; quarto, xxiv—367 pages, 2 plates.

It is rather a noteworthy coincidence that two of the most forward steps in hygrometry are mainly due to the illness of those by whom they were taken. Although Gay Lussac used a dry and wet bulb thermometer in 1822, it is to Dr. Mason that we are indebted for its introduction into this country, he being led, while residing in Madeira for the benefit of his health, to devise the arrangement so well known as Mason's hygrometer, which, slightly modified by Mr. Glaisher, now leaves nothing to be desired in that branch of research. So again with Saussure in 1780. Surprised by illness in the midst of his "*Voyages dans les Alpes*," even on the ridge of a lofty mountain, he was compelled to postpone his laborious researches, to return to Geneva, and, during his forced residence there, he perfected the hygrometer, the rough idea of which he had conceived five years previously, compiled a portion of the work now under notice, and prepared some of his new instruments for his mountain tours in 1781, the results whereof are discussed in this volume.

The four essays have the following titles:—

I. Description of a new comparable hygrometer.
II. Theory of hygrometry.
III. Theory of evaporation.
IV. Application of the preceding theories to some meteorological phenomena.

The first essay may be rapidly disposed of, the hygrometer therein described being now superseded. Saussure's hygrometer, as is generally known, consisted of a single hair, freed from unctuosity, and stretched by a slight weight, one end being fixed, and the other attached to the

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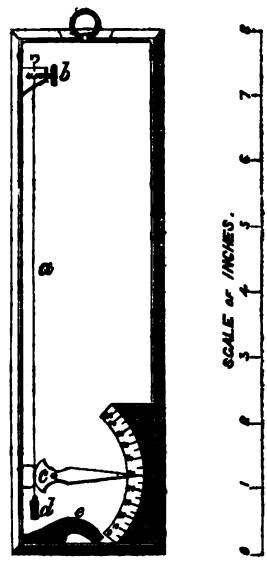
short arm of a lever; the long arm thereof of course multiplied the expansion and contraction of the hair produced by variations of humidity, and thus rendered them visible. The arrangement will be clearly understood by reference to fig. 3, where (*a*) is, the hair attached to the framework by the screw (*b*,) its bottom is fastened to the back of the index (*c*), and continued tension is ensured by the small weight (*d*) also attached to (*c*.) Of course if the hair contracts, the index will be carried towards 0, and if it elongates towards 100, the dark arm (*e*) is hinged to the corner of the frame, and designed to clamp the instrument when travelling.

Fig. 3.



It appears that the variation in the length of a healthy hair between the extremes of dryness and moisture is $\frac{1}{47}$ of its length, and this, we need hardly say, afforded in careful hands a useful approximation, though one to be superseded. Many reasons rendered Saussure's hygrometer better than its precursors, many reasons caused it to give place to the dry and wet bulb thermometer. Foremost among the former was its portability, which, as compared with previous ones, was very great, while among the objections which caused its abandonment, none was greater than the loss of sensibility which gradually supervenes.

It will be interesting to quote Saussurre's description of a few of the hygrometers in use before his was brought out, the first class consisting of strings, animal fibres, and other substances which elongate or contract with damp. Of course his own hair hygrometer was but the best of these, but he rightly points out that though they had been made, no one had examined the effect on any of them of variations in the pressure, density, movement, &c., of the air, nor had they even examined if the varying indications of the instrument were proportional to the amount of vapour in the air. The second class is based on the principle that the drier air is, the more water it can absorb, and on this M. Le Roi constructed an hygrometer, which Saussure says led to "enormous errors;" he goes on to describe one of these experiments, and as there is something erroneous in the account thereof, we transcribe it *literatim*:—

"On a, par exemple, renfermé une quantité d'eau bien déterminée dans un vase exactement luté; au bout d'un certain tems on a mesuré la diminution de cette eau, et l'on a cru que l'air contenu dans le vase s'étoit chargé de tout le déficient, sans penser que cette eau avoit toujours continué de s'évaporer, même après la parfaite saturation de l'air, parce que les vapeurs se condensant contre les parois du vase, il se faisoit une vraie distillation, qui auroit pu consommer à la longue une quantité d'eau, pour ainsi dire illimitée."

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The third class may be shortly described as dew point instruments. For example, the Academicians of Cimento took a conical glass vessel, which they kept full of broken ice or snow; they suspended this vessel point downwards in the open air, the moisture was condensed on the surface of the glass, and distilled drop by drop from the point of the cone, the greater or less frequency of the drops indicated to them the degree of humidity of the air. L'Abbé Fontana rendered this more portable by taking a plate of glass, quite clean and well polished, and of known weight; this he cooled to a certain temperature, exposed to the air for a certain time and then reweighed, the increase showing the amount of condensation. Lastly, M. Le Roi adopted a still more simple method, merely standing a glass of water in the air and at the air temperature, then gradually cooling it by the addition of iced water, until dew was deposited on the glass, when he noted the temperature of the water, and "judged the air more or less damp according to the degree of cold necessary to produce this deposition." Poor Saussure, here was the dew point instrument all but completed, and yet he proceeds to demolish it in the following paragraph:—

"These ingenious processes do honour to those who have invented them, and may even sometimes be useful, but if we consider that we can seldom make use of the closed vessel, and never employ any of them when the air is below freezing point, nor when the air is very dry, and that besides, the least particle of grease, and other causes difficult to avoid, may disturb the precipitation of this dew, and cause uncertain results, we can easily see that it will be very difficult for any such hygrometer to become universal. I have often tried M. Le Roi's process, with this difference, that instead of using ice, which is not easily carried about, I employed powdered sal ammoniac, which I throw little by little into the water, and which, when the air is not very dry, cools it sufficiently to produce condensation, but when I repeat it at short intervals, and when the air apparently remains unchanged, I do not always find the deposition commences at the same temperature."

(To be continued.)

DRYNESS OF THE AIR ON JUNE 27TH.

THE greatest difference between the dry and wet I remember noticing previous to this year was 20°·4 on June 28th, 1857, but as the temperature then was very high (dry 90°·4, wet 70°·0), the humidity on the natural scale was 33°, that is to say, the air contained just one-third of the quantity of moisture which it would hold if in a state of saturation.

On the 27th of last month the following readings were taken:—

Hygrometrical Observations at Camden Road, N.W., June 27th, 1867.
Lat. 51° 33′ N.; Lon. 0° 8′ W.; Height above Sea, 100 ft.

	4 ft. above ground.			20 ft. above ground.		
Time.	Dry Bulb.	Wet Bulb.	Humidity.	Dry Bulb.	Wet Bulb.	Humidity.
	Deg.	Deg.	0—100.	Deg.	Deg.	0—100.
9 a.m. ...	67·0	51·4	35	66·8	53·3	44
Noon ...	71·4	54·6	34	71·0	57·0	41
1 p.m. ...	76·4	57·6	32	75·5	60·0	39
2 p.m. ...	78·3	58·1	30	77·1	59·9	36
3 p.m. ...	78·5	58·1	29	78·0	60·8	37
4 p.m. ...	77·6	58·0	31	76·5	60·5	38

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From this we learn (1) that the dryness was 4 per cent. greater this year than previously noted at this station; (2) that the dryness was much greater near the earth than at 20 ft. above it; (3) In both cases the greatest drought was preceded by a period of easterly winds and high barometer; in both the rainfall was similar in quantity and in the few days on which it fell. Just as the dryness was greatest in 1867, so also was the range of temperature, which amounted to 35°·1 (80·0 — 44·9) in 1867, against 31°·3 (91·7 — 60·4) in 1857.

136, Camden Road, *July* 1*st*. G. J. SYMONS.

P.S.—Dry as the air was here, it was even drier at Aldershot, where at the same hour as I had 29° of humidity, Mr. Arnold had only 22°, his readings at 3 p.m., 27th, being dry 82°·0, wet 57°·0, humidity 22°.

HEAVY RAINFALL AT WORTHING, JUNE 3RD, 1867.

To the Editor of the Meteorological Magazine.

SIR,—I think it quite worth my while to bring before your readers some particulars of the heavy downpour of rain we had here on the night of June 2nd and 3rd.

After a magnificent summer day of intense heat, the thermometer standing at 75° Fah. in the shade, and the barometer (corrected to 32° and sea level) having fallen from 30·031 at 9 a.m. on the 2nd to 29·721 in. at 9 a.m. on the 3rd, after which period the mercury began to rise again; symptoms of an approaching storm began to show themselves in the course of the evening. Rain began to fall about 10 p.m. on the night of the 2nd, and continued without cessation for five and a half hours, viz., till about 3.30 a.m. of the 3rd. The greatest downpour, however, took place between 12 midnight and 1.15 a.m., when for about three quarters of an hour the rain came down in a perfect sheet of water, with *very* little hail. During the whole of this period the thunder was very loud, and the lightning most vivid.

On measuring the contents of my rain gauge next morning, I found the large amount of 2·08 inches in the receiver. This is almost equal to a fifteenth part of our yearly average, and is considerably in excess of the monthly average for June. I beg to annex to this a table, which I have deduced from the Registrar-General's returns for the town, whereby you will perceive that our yearly average for the last five years is 30·72 inches, and that for the month of June is 1·98 inches.

The thunderstorm which passed over this neighbourhood was not altogether *local*, but I am pretty sure we were almost the centre of the same.

I may, perhaps, remark that the highest reading of the barometer here this last month was (corrected and reduced to 32° and sea level) 30·541 inches at 9 a.m. on the 27th, the highest reading of the thermometer in the shade being 79·75°.

Yours truly, W. J. HARRIS.

Worthing, July 3rd, 1867.

Table as above, in inches.

	Yearly Total.		Total for June.
1862	32·9	.....	1·8
1863	28·7	.....	3·6
1864	24·3	.....	1·1
1865	35·7	.....	1·1
1866	32·0	.....	2·3
Mean average for 5 yrs. 1862–66...	30·72	Mean for June...	1·98

P.S.—There have only been *five wet days* this past month, and the total fall has been 2·45 inches. The last 16 days of the month were perfectly fine.

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THE STORM AT STEYNING.

To the Editor of the Meteorological Magazine.

SIR,—The bar. fell about 0·2 in. between 9 a.m. and 9 p.m. on June 2nd, and was followed by a remarkable thunderstorm between 12.40 and 2.40 a.m. 3rd, the rain falling in a way not often known except in the tropics. The lightning was a magnificent display, one flash preceding the report only by one second, the thunder crashing or rattling according to distance, but in the nearest flash seeming to *split* the obstructing medium with a snapping explosion.

The fall of rain, which began steadily at 10 p.m. 2nd, and continued with slight intermission until the deluge of the storm began about 1 a.m. 3rd, after which it moderated about 1.50 a.m., and had ceased entirely before 5.30 a.m., amounted by my rain gauge to the enormous quantity of 2·44 inches. I believe the most of this fell between 1 and 2 a.m., and all between 10 p.m. 2nd, and 4 a.m. 3rd, but I am enquiring on this point. Of course the low parts of roads, the cellars of houses, &c., have suffered severely by the flood.

I am, Sir, yours faithfully, HUGH INGRAM.

Steyning, Sussex, June 3rd.

[The storm began in the West of England in the afternoon of the 2nd, as may be inferred from the following notes:—*Calne,* Col. Ward, heavy rain in afternoon; ·24 in 30 minutes, and ·88 in the 24 hours.—*Wainsford, Lymington,* H. Fawcett, Esq., a heavy T S passed over the Isle of Wight between 7 and 8 p.m.—*Uckfield Observatory,* C. L. Prince, Esq., terrific T S between 1 and 3 a.m.; total rain was 1·47 in.—*Framfield Lodge* (1½ miles S. of Uckfield), Rev. T. E. Crallan, three heavy T S S between 2 and 5 a.m.; total rain 1·53 in.—T was heard at Staplehurst, Hastings, and Royston.—The *locale* of the heavy rainfall may be inferred from the following data:—

	in.		in.		in.
Steyning	2·44	Bromley Common	0·85	Ore, Hastings	0·69
Worthing	2·08	Harrow	0·33	Winchmore Hill...	0·62
Framfield.....	1·53	Twickenham	0·83	Pevensey	0·49
Uckfield	1·47	Camden Town	0·74	Waltham Abbey...	0·47
Seven Oaks	1·25	Banbury	0·72	Linton Park	0·37
Calne	0·88				

—ED.]

METEOROLOGICAL PERIODS.

To the Editor of the Meteorological Magazine.

SIR,—I have much pleasure in giving Mr. Nutter the information he asks relative to the weather 29 years ago. He will perceive that, in most respects, the recorded meteorology of the first half of 1838, might be used to describe the weather of the first half of 1867. The following notes are chiefly taken from Mr. Whistlecraft's "Climate of England." After a remarkably mild Christmas in 1837, we had a very severe winter with unusually intense frost; in January, 1838, the snow was excessively deep in some counties, so that the roads were impassable until excavations were made; the spring was cold. May 2nd, a delightful change, very fine and warm; 3rd, fine and warm; 4th, very fine and warm; 5th, clear and fine; 7th and 8th, fine, clear, and hot; 9th, cold morning but a hot day; 10th to the 19th, chiefly fine, but generally very cold and ungenial with piercing winds and some winterly frosts; 20th, a rise of temperature; 21st to the 26th, unsettled, but cold for the season; 28th, a rise of temperature; 29th, fine and warm; 30th and 31st, hot and sultry. At Chiswick the maximum temperature in May, 1838, was 78°, on the 8th. June had very few hot days, and the mean temperature at Greenwich was rather below the average. The 2nd of that month was hot, on which day there was heavy thunder, and to the 5th electrical showers were passing about. The rainfall, on account of the great storms, amounted to 3·37 inches (which was much more than we had in June, 1867), towards the end of the month a few days were very hot. 0·32 in. of rain and some thunder occurred in the first week of July, and a few days were very hot. In the second week several days were very hot, but after the

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middle of the month the weather was frequently cool for the season. August was a cool month, indeed the whole summer was considered a very cool one and rather fickle. The hay harvest was favoured by fine weather for the greater part and so was the corn harvest, but the crops were moderate. From the latter part of August to the middle of September the weather was chiefly fine, and occasionally very hot; indeed on the whole, it was fair to the equinox, and October was chiefly fine for about 3 weeks. It is remarkable that in 1809 as well as 1838, the mean temperature of nearly every summer month was below the average, and in each of those years the rainfall was rather below the average.

I do not expect that the weather of the remaining portion of this year will occur exactly in the same order as the weather of 1838, but it will probably bear a considerable resemblance to it.

July 4th, 1867. G. D. BRUMHAM.

REVIEWS.

Tableau Comparatif des Observations Pluviométriques faites dans le Sud-Ouest de la France de 1861 *à* 1864, par V. Raulin.

THE "missing link" between the two works by Professor Raulin which we noticed on a previous occasion; the former included rainfall returns from 1714 to 1860, the latter the year 1865; the present rendering the series complete, we have drawn up the following abstract of the fall at a few of the principal stations during the last six years. Professor Raulin is persevering steadily with his good work, and we congratulate him on his success.

Rainfall in France, 1860—65.

STATIONS.	1860	1861	1862	1863	1864	1865
	in.	in.	in.	in.	in.	in.
Paris	27·4	18·8	21·2	18·0	15·6	19·8
Poitiers	33·5	22·2	27·0	20·6	22·1	32·3
La Rochelle	39·3	23·0	23·7	24·8	19·5	33·6
Rochefort	33·9	18·7	18·1	23·3	23·0	34·9
Bordeaux	38·2	23·0	23·2	26·9	28·1	34·6
Bayonne	58·2	31·4	48·0	41·2	40·7	45·2
Aragori	...	...	96·1	69·5	51·8	75·8
Pau	40·7	26·1	44·4	29·8	34·6	...
Bagnères de Bigorre	68·9	38·2	52·0	53·2	48·3	59·0
,, de Luchon	...	...	40·8	40·5	33·8	42·3
Toulouse (Observatory)	21·9	21·7	22·2	20·8	18·9	...
Castelnaudary	32·0	28·3	29·3	17·5	23·2	15·6
Montpelier (Botanic Gardens)	40·6	33·3	52·9	32·7	40·8	30·4
Geneva	41·0	30·7	29·9	35·3	24·6	28·2
Great St. Bernard	56·2	31·7	38·0	51·0	61·6	43·7

From this we see that even at Aragori, the wettest station, the fall is not half what we have in Borrowdale.

Remarks on the Meteorology of 1866, by C BARHAM, Esq., M.D. [*Extract from Journal of Royal Institution of Cornwall.*] 8vo, 10 pp. WELL written notes on the weather in Cornwall in 1866; copious abstracts of the observations made at the Royal Institution at Truro; and monthly rainfall at eight stations.

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JUNE, 1867.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of nights below 32°.
			inches	inches.	in.							
I.	ENGLAND.	Camden Town	1·22	— 1·83	·74	2	6	82·5	12	42·8	29	0
II.		Staplehurst (Linton Park)	·85	— 1·89	·37	3	9	80·0	2, 11	40·0	29	0
,,		Selborne (The Wakes)	1·98	— 1·26	·81	2	8	75·5	2*	34·5	29	0
III.		Hitchen	...	...	...	...	...	...	...	...	...	...
,,		Banbury	1·80	— 1·48	·72	3	9	79·0	11	39·5	29	0
,,		Wisbech	1·25	...	·30	2	13	79·0	11	40·7	8	0
IV.		Bury St. Edmunds (Culford)	·73	— 1·85	·68	5	10	82·0	12	36·0	28	0
V.		Calne	2·18	...	·88	2	10	79·0	27	39·8	29	0
,,		Plymouth (Goodamoor)	2·25	— 2·90	...	...	10	83·0	...	36·0	...	...
,,		Barnstaple	1·02	— 3·10	·24	20	9	...	...	..	...	..
,,		Taunton (Fulland's School)	1·39	— 1·48	·46	2	7	·80	27	44·0	8	0
VI.		Shrewsbury (Highfield)	1·45	— 1·49	·49	3	9	76·0	26	...	...	...
,,		Tenbury (Orleton)	1·20	— 2·33	·35	2	13	79·8	27	39·8	8	0
VII.		Leicester (Wigston)	2·01	— ·75	·84	4	9	84·0	11	40·0	13¶	0
,,		West Retford	...	...	..	...	...	...	...	...	...	...
,,		Derby	2·38	— ·51	1·02	3	10	80·0	11†	45·0	15**	0
VIII.		Manchester	1·59	— 1·75	·40	3	13	81·8	12	45·0	15††	0
IX.		York	...	...	...	...	..	...	...	...	...	...
,,		Skipton (Arncliffe)	1·81	— 2·29	·40	7	8	74·0	29	40·0	8	0
X.		North Shields	1·49	— 1·25	·67	3	11	71·5	27	39·2	8	0
,,		Borrowdale (Seathwaite)	4·90	— 5·61	1·96	6	13	...	...	...	...	...
XI.	WALES.	Abercarn	1·46	...	·31	5, 7	7	84·0	28	46·0	8	0
,,		Haverfordwest	·71	— 2·94	·33	13	...	77·5	11	43·0	30	0
,,		Rhayader (Cefnfaes)	·55	— 3·43	·20	3	8	78·0	...	37·0	..	0
,,		Llanberis (R. Victoria Hotel)	...	...	...	...	...	...	...	...	...	...
XII.	SCOTLAND.	Dumfries	1·72	— 1·18	·30	4	14	78·5	26	43·0	23	0
,,		Hawick (Silverbut Hall)	1·12	...	·24	3	11	...	...	...	...	...
XIV.		Ayr (Auchendrane House)	3·17	— ·18	1·12	4	13	75·0	11‡	38·0	8	0
XV.		Otter House	3·04	— ·80	·50	9	12	70·0	11	38·0	8	0
XVI.		Leven (Nookton)	1·96	— ·28	·58	3	13	70·0	29	42·0	8	0
,,		Stirling (Deanston)	2·20	— ·72	·36	6	14	74·0	26	41·0	5 ‖‖	0
,,		Logierait	1·89	...	·77	3	11	...	...	...	...	...
XVII.		Ballater	1·37	...	·22	5	16	75·0	26	36·0	20	0
,,		Aberdeen	1·29	...	·45	6	12	75·0	28	40·4	8	0
XVIII.		Inverness (Culloden)	2·38	...	·59	6	12	69·8	26	40·7	8	0
,,		Fort William	3·95	...	·95	5	16	...	...	...	...	...
,,		Portree	5·66	+ ·88	1·46	5	13	68·0	26	32·3	8	0
,,		Loch Broom	2·98	...	·65	3	20	...	...	...	...	...
XIX.		Helmsdale	1·45	...	·27	8	12	...	...	...	...	...
,,		Sandwick	1·79	+ ·26	·34	7	17	...	...	...	...	...
XX.	IRELAND.	Cork	1·57	...	1·13	4	7	...	...	...	...	...
,,		Waterford	·93	— 2·05	·43	6	12	78·0	22§	46·0	8	0
,,		Killaloe	2·34	— 1·29	1·18	2	8	81·0	10	41·0	8	0
XXI.		Portarlington	·85	— 2·40	·51	5	10	70·0	11	41·0	8	0
,,		Monkstown	·48	— 2·14	·27	4	5	...	...	...	...	...
XXII.		Galway	1·75	...	·99	4	11	75·0	19	46·0	6, 8	0
,,		Bunninadden (Doo Castle)	1·64	...	·51	3	8	71·0	27	33·0	26	0
XXIII		Bawnboy (Owendoon)	1·20	...	·62	4	13	...	...	...	...	...
,,		Waringstown	·87	...	·37	4	9	76·0	11‖	38·0	7	0
,,		Strabane (Leckpatrick)	1·77	...	·57	4	15	74·0	10	37·0	26	0

*And 10th & 27th. †And 27th. ‡And 26th. §And 24th. ‖And 26th & 27th. ¶And 28th.
**And 16th. ††And 23rd. ‖‖And 14th & 19th.
+ Shows that the fall was above the average; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

CAMDEN TOWN.—T S on morning of 3rd.

LINTON PARK.—T on 3rd, 5th, and 7th, after which time the weather was exceedingly dry, though at no time hot, compared with former years; prevailing winds S. and S.W. up to the 14th, after that mostly N. and N.E. Wheat not generally in ear till the 21st being three days later than the average; 27th very dry day. Hay crop abundant and fine weather to mature it.

SELBORNE.—Prevailing wind N., with but little variation. The changes of temp. were remarkable, both at the beginning and end of the month. At Woolmer Forest on 30th I observed potatoes in every cottage garden cut by the frost, and the young ferns in the wood were also much cut.

BANBURY.—Wheat in bloom on 26th.

WISBECH.—Nearly half the month was dull, the wind being N.E. or N.W. was very cold; wheat in ear on 10th. There is a fine crop of hay, and as the last week was free from R, it was stacked in fine condition.

CULFORD.—A month of very variable temp. but chiefly very cold for the season, and the latter part of the month unusually dry.

CALNE.—Heavy R on 2nd, ·24 fell in ½ hour; TS in S. at 5 p.m. on 3rd; TS on 24th.

ORLETON.—The first 8 days were cold, with R every day; the remainder of the month dull, hot, and dry, with occasionally bright days. Bar. very high on 27th and 28th, with small misty R on the latter day from 7 to 11 a.m.; temp. of month below the average; no T or L.

DERBY.—Great progress made in securing a marvellous crop of hay.

NORTH SHIELDS.—Heavy R on 3rd, T on 4th. A cloudy month, though the R was little more than half the average. St. Bernard's lily, double red flycatcher, and summer violet in flower at the beginning of the month, French rose, scarlet geranium, grass iris, and double red campion in the middle of the month, pencilled geranium, perennial blue lupine, and red catchfly on 20th, 21st, and 24th; pink mimulus and dwarf summer aster on 25th, and many others at the end.

SEATHWAITE.—Only one day on which more than ·60 of R fell, the total fall being less than half the average, though the month was cold and cloudy.

WALES.

ABERCARN.—A fine month, with genial harvest weather.

HAVERFORDWEST.—First three weeks of June, cloudy and cold, wind constantly from N. and N.E.; after the 18th weather more genial; general characteristic of the month, dry, evaporation rapid, and almost entire absence of R; warmer during the last fortnight but the nights cold. Turnip crop likely to be a total failure; hay crop heavy, and likely to be saved in excellent condition.

CEFNFAES.—A dry month. Cold for the season at the beginning of the month. but warm and fine after the first 10 days.

SCOTLAND.

DUMFRIES.—First 9 days of the month showery with a low temp. Heavy R on 14th and occasional showers up to the 24th, after which the weather was warm and dry. T on 3rd and 14th; the mean temp. 1°·78 lower than the corresponding month last year; the copious showers at the beginning of the month caused a vigorous growth; crops of all kinds much heavier than last year but two or three weeks later. At close of month fine weather for haymaking.

SILVERBUT HALL, HAWICK.—The most pleasant and genial month of June that we have had for some years, the crops all look well and give promise of an abundant harvest.

AUCHENDRANE.—Although the mean temp. of this June has been rather low, especially during the nights, there have been no frosts, and vegetation made great progress. Heavy R between the 5th and 8th.

OTTER HOUSE.—A calm, cloudy, and moderately warm month; ther. from 38° to 70°; R below the average. The country may now be said to be in its fullest beauty.

DEANSTON HOUSE.—T on 3rd and 5th. Weather changeable from hot to cold; latter part of the month warm and fine; garden produce at the end of the month still backward for the season of the year.

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LOGIERAIT.—A fine month, and crops looking well. T on 3rd, something approaching a water-spout very closely, which cut up roads and did much damage.

BALLATER.—T on 2nd and 3rd. R fell to a considerable extent during the first week, and to the middle of the month the prevailing weather was cold for the season; after that time the temp. increased, reaching 75° on the 26th. Vegetation (which had previously been somewhat checked) advanced rapidly, and by the end of the month the country presented a very fine appearance.

ABERDEEN.—T on 4th, 6th, and 13th. A month of good, though somewhat changeable weather. Bar. about $\frac{1}{10}$ above the average, with $\frac{1}{10}$ greater range. R below the average. Prevailing winds N.N.W. Crops looking well, but from three weeks to a month later than last year, though much progress has been made during the last fortnight. Wild plants only coming into flower that were in seed at this time last year.

FORT WILLIAM.—T on 3rd. A pleasant month, though the fall of R, especially in the earlier portion, was rather above the average.

PORTREE.—This month on the whole has been the coldest June for many years, and consequently the crops are backward.

LOCHBROOM.—S and sleet on 7th, 8th and 9th. R daily from 1st to 17th.

IRELAND.

MONKSTOWN.—The driest month I have recorded since September, 1865, when ·06 fell; also the longest period without R since that date. We had from June 6th to the 2nd of July (26 days) only ·01 of R.

DOO CASTLE.—Wet to 6th, from which time to the end of the month only ·10 of R fell, the wind during this period being mostly N., N.W., and N.E. The temp. low for June. The early sown corn looks healthy and luxuriant, but oats sown in April and beginning of May, though looking green at a distance, are poor and short, and the ground cracked for lack of moisture. Though the weather has been dry, there has been less sunshine than usual.

OWENDOON.—The latter part of the month remarkably fine, and, with the exception of oats in some localities, all the crops look well. Fruit seems to have suffered much from the severity of the spring. Considering the long spell of dry weather we have had, there have been fewer sunny days than we expect in June, and evaporation consequently has been less. As an instance I may mention that there is low lying land near here, on which in winter we have a beautiful lake, and in summer excellent pasturage. Generally it is quite dry at the end of April, but this year there is water up to July, which I attribute to lack of powerful sun; others ascribe it to complete saturation of land from previous rains, probably both causes act together.

WARINGSTOWN.—First week showery, remainder of month dry and warm. Wheat very good, but flax and turnips failures.

LECKPATRICK.—Greater part of the R was measured in the first week. Most favourable weather for all growing crops; turnips promise well; meadows give heavy produce of hay. Heat moderate during the hottest period. N. winds and partial clouds prevented the ther. rising above 75°. Bar. nearly stationary at 30·75 from 10 p.m. on 26th to 10 a.m. 28th, from which time it fell gradually to 29·922 on 30th.

EVAPORATORS.

To the Editor of the Meteorological Magazine.

SIR,—I see that you have opened a department in the *Meteorological Magazine*, for gossip, queries, and the like, May I, therefore, enquire whether evaporating gauges give the exact loss of water from the earth? It is the custom, I believe, to leave a space unoccupied by water, in order that a sudden fall of rain may not cause the gauge to overflow. But then the sides of the vessel must shade a portion of the water surface from the sun's rays, so that evaporation must be retarded. I have an evaporator which is read at the close of each month only, and I am not aware if the leaving of a space, as described above, affects the result or not; could you inform me?—I remain, Yours truly, E. G. ALDRIDGE.

[We consider evaporators as at present constructed very unreliable, and have often expressed that opinion. We hope to discuss the matter fully before long, and shall be glad of Mr. Aldridge's assistance.—ED.]

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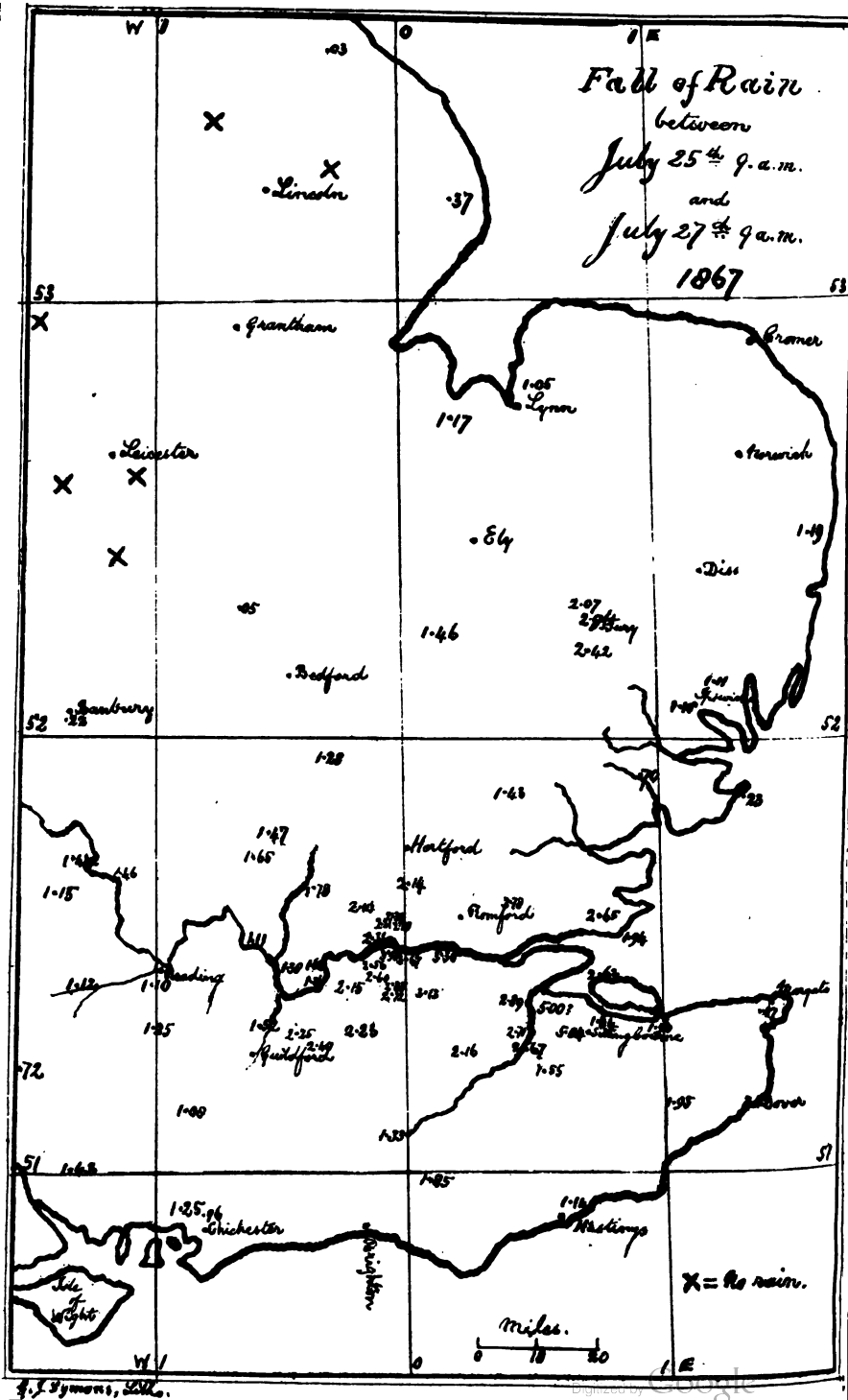
Fall of Rain
between
July 25th 9 a.m.
and
July 27th 9 a.m.
1867
Lincoln
Grantham
Leicester
Bedford
Sandbury
Ely
Lynn
Cromer
Norwich
Diss
Harford
Romford
Reading
Guildford
Chichester
Isle of Wight
Hastings
Dover
X = No rain.
Miles.
0 10 20
W 1 0 1 E
53
52
51
72

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

XIX.] AUGUST, 1867. [PRICE FOURPENCE. or5s. per ann. post free.

EXCESSIVE RAINFALL, JULY 26TH, 1867.

THE rains of the last week in July were as remarkable as any that have occurred of late years—the distinguishing characteristic being the great rate of fall. Excepting the remarkable case in 1857, when on August 6th, a water-spout burst over Scarborough, and the rain-gauge, which held 9 inches, was filled and found running over; and 1864, May 20th, when at West Retford, Notts, 3·10 in. fell in 2¼ hours, we can recall no rains more noteworthy than those which have lately fallen. We by no means wish to imply that such have not occurred—the converse is probably true—but if one branch of rainfall literature is poorer than another, certainly the deficiency is most absolute as concerns heavy rains—being, if we mistake not, confined to two papers by Mr. Glaisher: one in the *Proceedings of the Royal Society* in 1852, the other in the *Annual Report of the Meteorological Society* for 1858.

Complaints have been made that we have aimed too much at increasing the number of stations; to those who have made them, we commend the Map accompanying this paper, with the inquiry whether a few more stations along the banks of the Thames and the Medway would not have materially enhanced its value, though perhaps there is no county containing a better, or, as the following tables prove, a more careful and painstaking body of observers than Kent.

The rains must in equity be referred to St. Swithin, for the first fall to be noticed was one of 1½ inches, on July 15th, in Wales and Ireland; heavy rains fell almost daily until the 24th in the South of Scotland and in Ireland, resulting in heavy floods in many of the rivers. At Galashiels on the 21st the fall was ·60, and on the 22nd was 2·47; total, 3·07 in two days. Probably the most noteworthy was that which occurred in the North of Ireland on the 23rd, as described in the first two letters, (pp. 78, 79), but concerning which we can give no further particulars,

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from the simple fact that there is no observer between Dungar and Strabane, a distance of 35 miles; in fact, between those two to and N.E. and S.W. of the line joining them, there is an area of *than a thousand square miles without a rain gauge*, and this the the gauges have been offered free of charge, and observers asked in nearly every newspaper in the country. The 24th and greater of the 25th appear to have been generally fine.

Rain is reported from various stations as beginning at different ho between 9 p.m. and midnight, 25th, but it began so gently, and times reported are so irregularly distributed, that we shall act n safely by dating the commencement from midnight, the time when agree that the great downpour commenced at stations south of Thames; north of London it began later, for instance, Wantage Grundisburgh, 3 a.m. 26th; Cambridge and Bury St. Edmunds, 5 a.m Culford, 6 a.m.; and Beccles not till 6.45 a.m. The duration of he fall appears to have been least where the fall was heaviest, and great where least rain fell. Slight rain fell at intervals throughout the 26 but at Hartlip and Maidstone the heaviest rain had ceased at 5 a.m. at Sheerness at 6 a.m., and at most stations in the neighbourhood London by 10.30 a.m. In Berks, Cambridge, and Suffolk, the f began later, and ended proportionately later.

The time of commencement and termination is clearly shown by th following diagram, wherein the dotted horizontal lines mark thes elements, and also the duration of the fall. Singularly strong con firmation of the remarks just made, is afforded by Table III., wherein an arrangement dependent on the relative fall before and after 9 a.m 26th, classifies the stations almost as well as could have been done by means of a map—the amount of rainfall, in fact, becomes a geographer.

Very few words will suffice to explain the Map. The names are merely as guides to the returns, which are so entered that the decimal point occupies the position due to the gauge. The names of the stations are omitted, to give room for more entries, and the returns in Table I. being ranged in the order of their amount, the name of the station is directly ascertainable.

The facts appear to show that the heaviest fall was an excessively local one of about 5 inches, extending along the north side of the North Downs from Farningham nearly to Sittingbourne, Rochester, Chatham and Strood being on the northern limit of excessive fall. It was accompanied by a violent thunder storm, which was most severe between Faversham and Canterbury; 32 sheep were killed by lightning near the latter city. At about the same hour, 1.30 a.m., it was raining very heavily at Deptford and Greenwich, where about 4 inches of rain

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2·33	1·85	·48	,, REGENT'S PARK, *Dorset Square*, H. E. Segrave, Esq. ...	Total up to 10.27 a.m. 26th, 2·19.
2·31	1·86	·45	,, PIMLICO, *Bloomfield Terrace*, C. Harding, Esq.	From 9.15 p.m. to 9.45 p.m. 25th, ·02; Midnight 25th to 8 a.m. 26th, 1·63; 8 a.m. to 9 a.m., ·23; 9 a.m. to 5 p.m., ·36; 5 p.m. to 10.30 p.m., ·09.
2·25	1·72	·53	SURREY, COBHAM, *Pyports*, G. Dines, Esq.....	
2·23	1·65	·58	,, BANSTEAD, *Down House*, F. W. Field, Esq.	
2·22	...	...	MIDDLESEX, ISLINGTON, *Compton Terrace*, Dr. Ballard	Rained a little about 9.30 p.m. 25th, and incessantly from midnight till 10.30 a.m. 26th; total, 2·02.
2·21	1·82	·39	,, CAMDEN ROAD, G. J. Symons, Esq.....	Slight rain from 10 p.m. 25th till midnight, thence steady downpour till 11 a.m.; rain also from 2 till 9 p.m. 26th.
2·16	1·36	·80	KENT, SEVENOAKS, *River Head*, Rev. J. B. Murdoch.....	From 11 p.m. 25th, to 6 a.m. 26th, very heavy; 6 a.m. to noon, less; heavy rain at intervals afterwards.
2·15	...	...	SURREY, WIMBLEDON, T. Devas, Esq.	9 p.m. 25th, to 7 a.m. 26th, 1·28; 7 a.m. to 4 p.m., ·75; 4 p.m., to 7 p.m., ·12.
2·14	1·40	·74	ESSEX, WALTHAM ABBEY, Captain Smith	
2·10	...	...	MIDDLESEX, HARROW, B. Haughton, Esq., C.E.....	Between 12 p.m. 25th, and 12 p.m. 26th.
2·07	...	...	SUFFOLK, BURY ST. EDMUNDS, *Culford*, Mr. Grieve	All fell in 12 hours, 6 a.m. to 6 p.m. 26th.
1·95	1·43	·52	KENT, HYTHE, *Horton Park*, J. Kirkpatrick, Esq.	
1·94	1·72	·22	ESSEX, SOUTHEND, *Shoeburyness*, Major Curtis	
1·90	1·45	·45	KENT, FAVERSHAM, *Brogdale*, W. C. Stunt, Esq.	
1·86	1·44	·42	MIDDLESEX, TEDDINGTON, *Gomer House*, R. D. Blackmore, Esq. ...	(See Letter, page 81.)
1·85	1·33	·52	SUSSEX, UCKFIELD OBSERVATORY, C. L. Prince, Esq., F.R.A.S. ...	Fell between 10 p.m. 25th, and 6 p.m. 26th.
1·78	1·48	·30	HERTS, WATFORD HOUSE, R. Clutterbuck, Esq.	From 10 p.m. 25th, to 10 p.m. 26th.
1·65	...	...	BUCKS, MISSENDEN ABBEY, J. Begbie, Esq.	R from 3 a.m. to 3 p.m. Wind N.E. and S.W.
1·64	1·44	·20	KENT, SITTINGBOURNE, *Tong*, G. Eley, Esq.	
1·62	1·45	·17	MIDDLESEX, TWICKENHAM OBSERVATORY, A. Wiss, Esq.	
1·55	1·51	·04	KENT, STAPLEHURST, *Linton Park*, Mr. J. Robson.....	26th very heavy rain, with N. wind. Rain said to be much more than 1·51 at places round here.
1·52	1·19	·33	SURREY, CHOBHAM, Dr. Ward	Between 10 p.m. 25th, and 8 p.m. 26th, 1·50 in. fell.
1·47	1·08	·39	HERTS, BERKHEMPSTEAD, W. Squire, Esq.	From 1 am. 26th; rained all day with boisterous wind.
1·46	·47	·99	CAMBRIDGE, CAMBRIDGE, *Brook House*, G. Warren, Esq.	From 5 a.m. 26th, to 9 a.m. ·47; 9 a.m. to 8 p.m. ·99.
1·46	...	...	BERKS, WALLINGFORD, *The Castle*, J. K. Hedges, Esq.	Began 12 p.m. 25th.
1·44	1·20	·24	,, ABINGDON, *Long Wittenham*, Rev. J. C. Clutterbuck	Rain began at 1 a.m. 26th; heaviest at 3 a.m.
1·43	·99	·44	HANTS, WINCHESTER, *Otterbourne*, J. B. Yonge, Esq.	From 11 p.m. 25th, to 11 p.m. 26th.
1·43	·67	·76	ESSEX, DUNMOW, *High Roding*, Rev. E. Maxwell	All fell between midnight of 25th and midnight of 26th. Wind on 26th N. strong. All fell between 25th 11 p.m. and 26th 2 p.m.
2·62	2·39	·23	KENT, SHEERNESS, J. Lund, Esq.	R from Midnight to 7 a.m.; especially heavy from 1.15 to 1.30 a.m., and at 3 a.m., when it again increased in violence. Much T and L. Wind E. by S. Low parts of the town inundated.
2·60	2·00	·60	SURREY, BRIXTON HOUSE, Miss Sweeting	

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fell. Nearly 4 inches fell at Billericay in Essex, but whether or not the district between there and Deptford had an equal quantity, there is not at present evidence to prove. Later still, there was an excessive fall of nearly 3 inches at Bury St. Edmunds, but this appears to have been quite separate from the other falls.

We do not presume to state *why* the downpour on the 26th was so excessive, any more than *why* nearly twice as much rain fell at Deptford as at Camden Town, one having 4 inches and the other 2¼, though only 7 miles distant; or *why* Maidstone had 2·7 in. and Linton Park 1·5 in., though also only 7 miles apart; or *why* Hartlip had 5·04 and Tong, 6 miles off, had only 1·64. These anomalies are the special attribute of violent rains, and at present must remain unexplained. Their locality varies; possibly it may be a century before the places which have had such excessive falls have the like again, but such will occur, and it is the duty of all to be prepared for them. As to the rest, let the tables and letters speak for themselves.

TABLE II.—*Approximate Commencement, Duration, and Termination of Rain.*

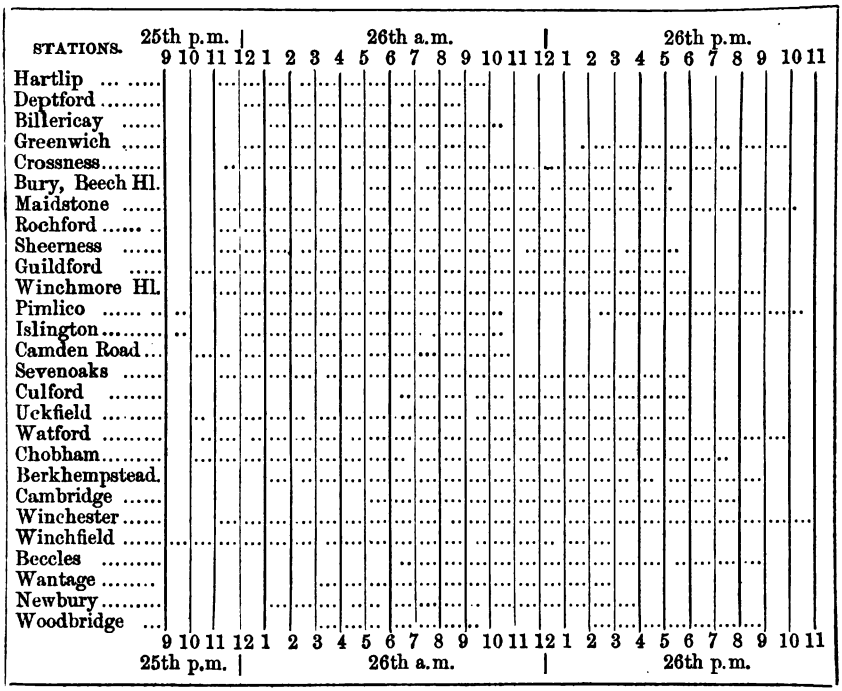

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TABLE III.—*Per Centage, of Total Rainfall in the two days, which fell before 9 a.m. July 26th.*

(Stations arranged according to per centage—*e. g.*, at Hartlip nearly all the rain fell before 9 a.m. 26th, the amount then measured being 95 per cent. of the total measured on 26th and 27th.)

Per cent.		Per cent.	
95	Kent, Hartlip.	77	Middlesex, Holloway.
92	,, Maidstone.	77	Surrey, Brixton Hill.
91	,, Sheerness.	77	,, Guildford.
88	,, Maidstone F.R.	77	,, Cobham.
87	Essex, Rochford.	76	,, Stockwell.
84	Kent, Greenwich.	74	,, Banstead.
84	,, Crossness.	73	Kent, Bromley Common.
82	Surrey, Penge.	65	Essex, Waltham Abbey.
82	Middlesex, Camden Town.	63	Kent, Seven Oaks.
81	,, Pimlico.	59	Essex, Billericay.
79	Kent, Deptford.	31	Suffolk, Lawshall.
79	Middlesex, Islington.	21	,, Bury.

ALPHABETICAL LIST OF TOWNS & VILLAGES HAVING NO RAIN.

Abercarn, Monmouth.
Aberdeen, Aberdeen.
Ayr, Ayr.
Ballater, Aberdeen.
Barnstaple, Devon.
Bishopscastle, Salop.
Cardiff, Glamorgan.
Chepstow, Monmouth.
Clumber, Notts.
Deanston, Perth.
Derby, Derbyshire.
Dumfries, Dumfries.
Dymock, Gloucestershire.
Gainsborough, Lincolnshire.
Haverfordwest, Pembroke.
Hawick, Hawick.
Hinckley, Leicestershire.
Ilkley, Yorkshire.
Knaptoft, Leicester.
Lancaster, Lancashire.
Leicester, Leicestershire.
Leominster, Herefordshire.
Logierait, Perth.
Malvern W., Worcestershire.
Manchester, Lancashire.
Market Drayton, Salop.
Matlock, Derby.
Neath, Glamorgan.
Orleton, Worcester.
Pentyrch, Glamorgan.
Rhayader, Radnor.
Shrewsbury, Salop.
Wigston, Leicestershire.
Willersley, Derby.
Wragby, Lincoln.
York, York.

REMARKABLE RAINFALL IN IRELAND, JULY 23RD.

To the Editor of the Meteorological Magazine.

SIR,—By your letter in the *Times*, it appears that communications on the subject of the late heavy rains will be acceptable. Here more has fallen than at any time the last five years, during which regular measurements have been taken. In the memory of the oldest inhabitant (to whose appeal, and not, I am sorry to say, to old registers, reference must be made) the inundation of Strabane has never reached to such a height. The main street of the town was traversed by a rapid stream about 3 or 4 feet deep, the cellars and lower stories of all the houses being flooded. Communication was kept up by boats through the principal streets of the town.

On the 16th there was measured 1·38 ; wind S.E.

During the three days, 20th, 21st, 22nd, there was measured again 1·65, with N.E. wind.

On the 23rd, Tuesday, at one o'clock, light wind still blowing from N.E., but not a cold wind ; the fall commenced and continued without intermission for 17 hours, until six o'clock next morning (Wednesday, 24th, 6 a.m.) There was measured in the rain gauge that day, at the usual hour, the large quantity of 2·90 in., being nearly one inch more than ever fell here. The receiving vessel

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inside my Glaisher rain gauge overflowed into the body of the instrument. The maximum rainfall hitherto has been—

17th June, 1863	1·19	15th November, 1866 ...	1·17
23th August, 1865	1·29	24th July, 1867	2·90
28th November, 1865...	1·95		

This excessive rainfall, with North Easterly wind, is unparalleled; its occurrence at this season of the year has been very destructive to growing crops on all the lowlands; cattle, grazing on the islands of the river, in many cases were carried down the flood and drowned; most of the embankments have been destroyed, hay stacks in numbers have been floated out to sea, and general damage done, of which it is impossible to form an estimate. A promising turnip field near this house is in one part completely covered over with gravel, having the appearance of a macadamized road; a wooden foot-bridge was carried away, not a morsel of it has been recovered.

It is a cause of surprise on reading the Meteorological Report in the *Times* of July 24th, that the rainfall was generally so small in other places (there are only two from Ireland.) The greatest quantity in that return was at Greencastle, about 20 miles north of Strabane, only ·65. The wind generally appears to have been blowing from N.E. all over Ireland, and was westerly in England, with corresponding low and high temperatures in each country (51° and 59°) during the whole of the rainy interval from Tuesday to Friday, the heavy rain ceasing here on Wednesday at 6 a.m., and beginning in London on Thursday at 10 p.m.

You promise a map, showing the relative fall in different localities. Would it not be well to distinguish the two rainfalls—that which commenced with such tremendous force in the North of Ireland on 23rd, 24th, and that which you describe in South of England on 25th, 26th? Also, to notice the direction of wind at each place of observation. The opposite directions of wind in northern portions of these Islands and the southern, are evident from the *Times* returns. Are these not such as might have enabled a weather prophet on that morning to have foretold heavy rains in the South of England?

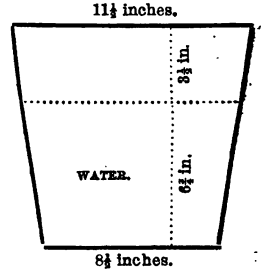
The barometer was at its lowest on 22nd, 9 a.m., 29·30 nearly, from which date it has gradually risen every day.—Yours truly, C. MAXWELL.

Leckpatrick Rectory, Strabane, *July 29th*, 1867.

To the Editor of the Meteorological Magazine.

SIR,—In your letter in the *Times*, dated the 26th ult., you express a wish that any great fall of rain should be communicated to you; and I therefore send you an account of a very severe storm of rain, lightning, and thunder, which occurred here on the 23rd ult., and I may begin by stating that what I write I know to *my own knowledge*, and not from hearsay evidence.

The storm began here about 11.45 a.m., and lasted till about 3 p.m.; such a storm is not remembered here by "the oldest inhabitant." There was in my garden, in an open space, an ordinary galvanized iron circular bucket, which had been left there *quite empty* just before the rain began, and when I looked at it about 4 p.m., I was so struck with the amount of water in it that I measured it accurately, and in the accompanying sketch I send you the measurements of the bucket, and also the depth of water that was in it, 6¾ in., and which must all have been rain that fell during the time I have mentioned. I sent a copy of the sketch to Dr. Robinson, of the Observatory, Armagh, and he computes the rainfall to have been 4·84 inches, to which is to be added, in his opinion, about half-an-inch for loss of water caused by the splashing of the rain. He states that this is nearly triple anything he has known at Armagh for the last 35 years.



Owing to this neighbourhood being hilly, not much damage has been done, and I think I am the largest loser; but a small stream in a gentleman's garden near here, that usually runs in its proper course, became a torrent, and went

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right through his *drawing-room*, flooding it to the depth of 39 inches. Should you think this of any importance, I shall feel obliged if you would calculate the rainfall, and let me know if your calculation agrees with Dr. Robinson's.

Sincerely yours, A. S. NICHOLSON.

Lisdhu, Dungannon, co. Tyrone, Ireland, *Aug.* 4, 1867.

PREVIOUS HEAVY RAINS.

To the Editor of the Times.

SIR,—The excessive rain of the early hours of this day will probably render a few particulars concerning its amount generally acceptable.

Those who have perused my various publications on the subject are aware that there was a considerable drought in the years 1854 to 1858 inclusive, the five years yielding little more than four years usually do; and that the subsequent eight years (up to January 1, 1867) have given the ordinary average fall. The first six months of the present year have also given the average fall—rather above it in England and Ireland, and below it in Scotland. On the whole, we may therefore say that (the deficiency from 1854 to 1858 being written off "hopeless") our rain accounts were fairly balanced at the beginning of the present month.

Of course in a dry district like London, with only 24 in. of rain yearly, it is not likely that our "heavy rains" can compete in quantity with mountainous stations which have six or eight times as much as we have; but, relatively to our total fall, I have shown (*British Rainfall*, 1866, p. 72) that we have much the most remarkable rains. For example, the greatest rain in 24 hours I find recorded at Greenwich was on the 14th of July, 1853, when 2·63 inches fell, being 11 per cent., or 1-9th of the yearly average; a ninth of the yearly average at Seathwaite (140 inches) is 15·6 inches, yet they have never had more than 6·6 inches in 24 hours—that is to say, not 5 per cent., against our 11 per cent.

The amount registered here between the 25th of July, 10 p.m., and the 26th of July, 9 a.m., was 1·82 in.

The following are all the instances in which the fall in the suburbs of London has amounted to 1½ in. or upwards in 24 hours upon which I can at present put my hands:—

GREENWICH OBSERVATORY, 1837 TO 1866.

	Inches.		Inches.
1843—August 23... ...	2·16	1853—July 14... ...	2·63
1851—August 17... ...	1·71	1857—October 22 ...	2·59
1852—July 25	1·97	1859—September 26 ...	1·55

PLAISTOW AND TOTTENHAM, 1807 TO 1827.

	Inches.		Inches.
1808—July 27	1·88	1820—September 17 ...	1·52
1811—July 21	1·61	1824—May 15 ...	1·67
1816—June 26	2·05	1825—May 12 ...	1·70
1818—February 22 ...	1·62	1826—July 22 ...	1·83

CAMDEN TOWN, 1858 TO 1867.

	Inches.		Inches.
1859—September 26 ...	1·66	1867—July 25 ...	1·82
1863—June 19	1·55		

Although the rain of this morning stands correctly entered as above for the rain-fall day ending at 9 a.m., it may be well to mention that the total fall between 10 p.m. last night and the same hour this night is 2·21 inches. From the above it will be seen (1) that it is rather more than ten years since we had so heavy a rain as last night, (2) that in 52 years there have only been seven days on which the rain has been greater than in the present instance, or (3) if we take the 24 hours from the commencement of the rain, then only two instances out of 52 years. Moreover, during the same 52 years there have been 85 days on which an inch or more of rain has fallen; of these 11 occurred between the 21st and 27th of July; and in the 17 instances quoted above, five are in that week.

Communications on the subject will be very acceptable, as I intend to prepare a map showing the relative fall in different localities.

I am, Sir, your obedient servant,

136, Camden Road, N.W., *July 26th.* G. J. SYMONS.

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PREMONITIONS OF THE FALL.

To the Editor of the Meteorological Magazine.

SIR,—From your letter in the *Times*, I conclude that you may like to have my observations as to the recent rainfall.

On the evening of the 24th we noticed a very peculiar appearance in the S.E. after sunset. The sky was chiefly overcast, with a free display of red streamers all over the east and south, but in the south-east was a beautiful fan of blue divergent radii rising 30° above the horizon and breaking across the redness, like a windmill, with blue sails to it. Calling to mind my Georgics,

"Densa inter nubila sese,
Diversi erumpunt radii,"

I expected heavy rain, but as only a few drops fell that night, I put it down as an error. Neither on the 25th was there, until the evening, any indication that St. James would do his best to drown St. Swithin. But towards sunset a heavy nucleus of cloud appeared in S.E., with a sultry breeze from that quarter, and the sky became filled with darkness. Some drops of rain fell about 9 o'clock, and one or two flashes of distant lightning were seen. However, it did not begin in earnest until past 11 p.m., and then it came down pretty quietly, without any wind or thunder. In the morning I was surprised to find 1.44 in. in my rain gauge at 9 a.m., and domestic pets still falling. From 9 to 10 a.m., 0·14 was the measure, and 0·10 at 11 o'clock when the clouds relaxed a little. It rained again for most part of the day, seeming not to know when to stop. I believe, however, that all was over about 11 p.m. on the 26th, being 24 hours complete. The entire depth was 1·86, less (I see) than you had. The wind, during the downpour, backed from S.E. to N.E., and thence (half a gale) to N.W., with low temperature for July. To-day the sky looks exhausted, and I trust we shall have fine weather.

Yours faithfully,

Teddington, *July 27th*, 1867. R. D. BLACKMORE.

[The above allusion to a windmill-like appearance is singularly corroborated by a friend, who has sent us a sketch of the W. sky, as seen from Kentish Town on the 25th, at 9 p.m., with the four sails as complete as possible. It is a strange story, but *true* nevertheless.—ED.]

EXCESSIVE FALL OF RAIN.

On Thursday night (25th), shortly before 12 o'clock, rain began to fall in torrents in London, accompanied with heavy gusts of wind from the W.N.W., and occasional flashes of lightning. The rain fell without intermission till 11 o'clock yesterday forenoon. It then ceased, but it began again at 2 o'clock, and continued until a late hour in the evening. The fall of rain was heavier than any we have had this season, and it has flooded the Thames and its tributaries. As the tide rose yesterday various parts of the banks of the river, particularly on the southern side, between Greenwich and Wandsworth, including a considerable portion of the Southern Embankment, became flooded, and very serious damage has been done by flooding to cellars in all parts of South London. At Chatham and Rochester the rain fell in sheets of water, resembling more the torrents occasionally met with in tropical countries than anything usually experienced in these latitudes. In both Rochester and Chatham the principal streets were turned into water-courses, in many parts both roadway and pavement being several inches under water. In the lower parts of the town the results of the storm were exceedingly disastrous, there being scarcely a house which was not flooded, while in the neighbourhood of the lower part of High Street, Chatham, most of the houses were submerged, and the cellars and lower apartments were filled with water. During the greater of yesterday the unusual spectacle was to be witnessed of powerful steam fire-engines from Chatham Dockyard pumping the water out of the cellars of the houses inundated in High Street.

By the arrival of the morning and mid-day trains at London, yesterday, intelligence was brought of the existence of floods from Stratford to Cambridge, on the Great Eastern Railway, the greater part of the land on each side of the line presenting the appearance of an immense river.—*Times, July 27th*, 1867.

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To the Editor of the Meteorological Magazine.

SIR,—I lose no time to inform you that on measuring the rainfall this morning, the result gave 4¾ inches and 3 hundreths, which fell in the night and morning, between the hours of one and five; almost a calm.

I am that oft-named person "the oldest man in the village," and certainly I never measured such a large rainfall before.

The bottle I found quite full of water, and a considerable quantity more in the tin case, which would otherwise have been lost.

My old rain gauge proved of no use, as the bottle could not contain all that fell.

Believe me, very truly yours,

Hartlip, *July 26th*, 1867. WM. BLAND.

To the Editor of the Meteorological Magazine.

SIR,—I have just received from my friend the dimensions of the pail, which were given to him by the person who placed the empty pail on the ground (1 mile S. of Chatham), free from buildings and trees, and who also witnessed the overflowing of the rain-water from the same.

Dimensions of the pail:—size across the top, 10¾ inches; size across the bottom, 6¾ inches; depth, 9½ inches.

I have further to mention, that the roads after the storm were found much torn up, exhibiting deep gullies, and heaps of stones and soil in places.

In the neighbourhood of the parish of Meopham, on the London Chatham and Dover Line, a few miles on the London side of Rochester, the roads were greatly broken up by the storm of rain, which excavated gullies deep enough to bury a horse (so my friend informed me). This being the state of the case, a larger quantity of rain must have taken place there than at Hartlip,

Believe me, very truly yours,

Hartlip, Sittingbourne, *August 10th*, 1867. WM. BLAND.

NOTES AND SUNDRIES.

To the Editor of the Meteorological Magazine.

SIR,—Perhaps it may be interesting to compare the humidity of the air here on the 27th June with the table you have given.

The thermometers are 4 ft. above the ground, and about 410 feet above the sea. The comparison seems to show that there is very little difference due to elevation above the sea compared with that which you found to result from elevation above the ground.

Humidity at Tunbridge Wells, June 27th, 1867.—*4 ft. above ground, and 410 ft. above sea.*

Hour.	Dry Bulb.	Wet Bulb	Deg. of humidity	Dewpoint	Hour.	Dry Bulb	Wet Bulb	Deg. of humidity	Dewpoint
	°	°	0—100	°	p.m.	°	°	0—100	°
9 a.m.	66·0	53·0	42	42·5	2.30	77·2	57·0	29·6	42·9
10.30	71·0	54·5	35	42·0	5	71·0	56·5	39	45·5
11.15	74·0	56·5	34	43·7	7.30	66·5	54·0	43	44·0
12	74·0	55·0	31	41·1	8.0	60·2	50·8	52	42·9
1 p.m.	76·3	56·2	30	42·0	10·30	58·5	50·0	55	42·4
2	77·0	57·0	30	43·0					

This table shows that the air contained least vapour at noon, and most at five p.m., while the relative humidity was least at 2.30, and greatest (of the observed times) at 10.30. The temperature of the dew point was so uniform throughout the day, that from the temperature of the air the reading of the wet bulb, almost at any time, might have been predicted, when it had once been observed and the dew point found. This seems generally to be the case, at least in dry weather.

In July we have had 4·6 inches of rain, but the downfall on the 25th, which washed people elsewhere, was more moderate—only 0·93 inch. The mean temperature was 58·6, cold for July. The sun maximum in vacuo reached 157°·5 on the 1st, but never exceeded 141° on any other day. The highest in the shade was

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81° on the 1st. If ozone be healthy, Tunbridge Wells must be a healthy place, for the average was 6 on Schonbein's scale.

I think in a previous number you remarked upon Mr. Buchan's plan of deducing the mean temperature from the simple mean of the daily maxima and minima, as opposed to the Greenwich plan. I think the subject is very important. Here the Greenwich corrections seem to answer very well, but I do not find that they answer at all in Yorkshire. I believe that two causes produce this result. The mean temperature of Kent is but little above that of Yorkshire, but the daily maximum is always considerably higher, owing to the increased power of the sun, due to 3 degrees difference in latitude, while nocturnal radiation is about equal. (By the way, Mr. Buchan is obviously wrong in supposing solar radiation to increase as you go north; the records of the Meteorological Society show exactly the contrary, if all records are omitted where the black bulb in vacuo is not placed, as it is at Greenwich, on the ground or grass, and where the stations are not approximately at the same level.) The minimum is also somewhat lower in Yorkshire. The following table, extracted from the last four reports, shows the elevation of the maximum in the South East of England to an extent disproportioned to the excess of its mean temperature.

NEAR LONDON (4 Stations.)

	Mean Min.	Mean Max.	Mean Temp.
1st quarter, 1867	33·1	45·4	39·2
2nd ,, 1866	43·7	63·7	52·7
3rd ,, 1866	50·9	69·4	59·0
4th ,, 1866	40·0	52·8	46·4
	41·9	57·8	49·3

YORKSHIRE (4 Stations.)

1st quarter, 1867	32·0	42·0	37·1
2nd ,, 1866	41·8	59·3	50·6
3rd ,, 1866	49·5	65·1	56·4
4th ,, 1866	38·9	49·6	45·2
	40·5	54·0	47·3

TAKING THE WHOLE YEAR.

	Mean Temp.	Simple Mean of Max. & Min.	Correction required.
Near London	49·3	49·9	—0·6
Yorkshire	47·3	47·2	+0·1

Thus it appears that as the Greenwich corrections are on an average 1°·1, the mean temperature of the stations near London (including Greenwich) for the year ending March, 1867, would have been 0°·5 too low if they had been calculated solely from the corrected mean of the maxima and minima, and that of the Yorkshire stations 1°·2 too low. I assume, of course, that the mean temperatures given in the Registrar-General's Report are correct. Comparing the Yorkshire stations with Greenwich, we have for same period—

	Mean Temp.	Simple Mean of Max. & Min.	Correction required.
Greenwich	49·2	50·1	—0·9
Yorkshire	47·3	47·2	+0·1

So that the Greenwich corrections do for Greenwich, as was to be expected, but not perfectly for other stations in the neighbourhood, and not at all for Yorkshire. There, is, therefore, another reason besides difference of latitude, which also affects the correction required. A station in a valley will have a lower minimum than a station on a hill or rising ground, but the maximum will not be much higher, and yet the mean temperature will be higher in the valley. Therefore, for stations in the South of England on rising ground, especially if facing the sun, I should expect the Greenwich corrections to be right, but for places in a valley, I should take say half of the correction given. In the North of England, places in a valley should use the simple mean, but for places on a hill I can only guess that perhaps half the Greenwich correction might do.

One thing is clear, that the subject ought to be very carefully investigated.

I am, Sir, yours truly, F. W. STOW.

Tunbridge Wells, August 1st.

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JULY, 1867.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of nights below 32°.
			inches	inches.	in.							
I.	ENGLAND.	Camden Town	4·30	+ 2·51	1·82	25	14	76·9	1	44·0	28	0
II.		Staplehurst (Linton Park)	4·53	+ 2·55	1·51	25	16	80·0	12	43·0	9‡	0
,,		Selborne (The Wakes)	4·82	+ 2·62	·95	25	14	73·0	12†	39·5	25§	0
III.		Hitchen	4·24	+ 2·34	·72	26	17	73·0	1, 10	42·0	27	...
,,		Banbury	2·17	+ ·11	·43	15	18	75·0	10	40·0	28	0
,,		Wisbech	3·40	...	1·15	26	14	79·0	10	42·0	6	0
IV.		Bury St. Edmunds (Culford)	4·49	+ 2·50	...	...	15	82·0	10	39·0	8	0
V.		Calne	...	...	...	...	...	...	...	...	...	...
,,		Plymouth (Goodamoor)	6·63	+ 2·35	...	...	...	82·0	...	38·0	...	...
,,		Barnstaple	3·73	+ ·87	·76	16	16	...	...	..	...	...
,,		Taunton (Fulland's School)	3·35	+ 1·45	·81	25	14	80·5	11	43·5	24	0
VI.		Shrewsbury (Highfield)	1·65	— ·42	·67	15	11	83·0	...	...	...	...
,,		Tenbury (Orleton)	2·97	+ ·58	·55	2	15	77·8	10	36·8	28	0
VII.		Leicester (Wigston)	2·24	+ ·14	·69	16	12	85·0	10	40·0	7‖	0
,,		West Retford	...	...	..	...	..	...	...	...	...	...
,,		Derby	1·92	— ·27	·39	15	12	79·0	10	44·0	25	0
VIII.		Manchester	4·23	+ 1·59	1·11	16	14	86·6	11	41·7	6	0
IX.		York	2·40	+ ·46	·44	3	13	75·5	11	44·0	6	...
,,		Skipton (Arncliffe)	4·29	+ 1·06	·74	15	14	73·0	1, 10	39·0	29	0
X.		North Shields	3·20	+ 1·39	·81	18	15	70·0	4, 14	45·0	6	0
,,		Borrowdale (Seathwaite)	10·43	+ 2·29	2·67	17	16	...	...	...	...	...
XI.	WALES.	Abercarn	5·13	...	1·74	15	12	79·0	12	47·0	6, 31	0
,,		Haverfordwest	3·01	— ·29	1·27	16	...	78·6	11	41·0	31	0
,,		Rhayader (Cefnfaes)	4·53	+ 1·68	1·35	15	14	78·0	...	37·0	..	0
,,		Llanberis (R. Victoria Hotel)	8·92	...	1·73	16	16	...	...	...	...	...
XII.	SCOTLAND.	Dumfries	5·63	+ 3·39	1·45	23	13	...	...	...	...	0
,,		Hawick (Silverbut Hall)	6·89	...	1·92	22	15	...	...	...	...	...
XIV.		Ayr (Auchendrane House)	5·48	+ 2·17	1·91	22	13	75·0	9	38·0	7	0
XV.		Otter House	3·43	+ ·12	·58	12	12	75·0	13	43·0	20	0
XVI.		Leven (Nookton)	6·49	+ 4·22	1·77	14	17	76·0	10	42·0	29	0
,,		Stirling (Deanston)	4·18	+ ·78	·56	11*	15	76·8	10	37·0	29	0
,,		Logierait	6·07	...	1·51	14	16	...	...	...	...	..
XVII.		Ballater	4·89	...	1·12	15	20	79·2	9	34·5	7	0
,,		Aberdeen	3·40	...	·94	15	18	70·0	10	41·7	7, 8	0
XVIII		Inverness (Culloden)	2·71	...	·72	19	14	71·2	10	45·7	25	0
,,		Fort William	4·77	...	·82	12	17	...	...	...	...	...
,,		Portree	2·97	— 3·10	1·26	12	10	73·8	10	35·2	3	0
,,		Loch Broom	2·10	...	·55	18	18	...	...	...	...	...
XIX.		Helmsdale	2·72	...	·49	16	15	...	...	...	...	...
,,		Sandwick	1·58	— ·31	·38	3	12	64·2	14	37·4	2	...
XX.	IRELAND.	Cork	2·93	...	·65	26	19	...	...	...	...	...
,,		Waterford	5·02	+ 1·71	·84	22	13	79·0	4	48·0	24	0
,,		Killaloe	3·62	+ ·43	·85	21	15	82·5	8	39·0	29	0
XXI.		Portarlington	2·65	— ·89	·81	13	21	73·0	11	41·0	6	0
,,		Monkstown	2·56	+ ·13	1·28	15	17	76·5	10	39·8	20	0
XXII.		Galway	3·15	...	1·49	13	18	77·0	10	47·0	20¶	0
,,		Bunninadden (Doo Castle)	4·63	...	1·15	3	16	75·0	8	35·0	30	0
XXIII		Bawnboy (Owendoon)	5·40	...	1·25	11	20	79·5	8 & 9	38·0	5	...
,,		Waringstown	6·04	...	1·30	15	14	82·0	8	37·0	5	0
,,		Strabane (Leckpatrick)	8·45	...	2·90	23	16	79·0	9	34·0	6	0

*And 22nd. †And 13th. ‡And 24th & 29th. §And 30th. ‖And 27th & 29th. ¶And 25th.

+ Shows that the fall was above the average; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

CAMDEN TOWN.—T S on 13th. Excessive R on morning of 26th.

LINTON PARK.—Distant T on 2nd, 13th, 14th, 26th, and 27th. High wind on 15th and 16th. A cold wet month for July, the rainfall of 26th exceeding that of any day for upwards of 12 years. Winds mostly S., but the rain of the 26th came from N. The harvest will be late, many fields scarcely changing color at the end of the month, but the hay has in general been secured in good condition; the rainfall of the 26th was said to be much greater in some places than here.

SELBORNE.—Oppressively hot, with L on the 1st. Prevailing wind from 10th to 25th S. to S.W., the remainder N.W. T on 14th; T S on 28th, with H from 3 to 5 p.m. This storm was very partial; at Newton Valence (W.) and at Greatham (S.E.) violent hail, while at Alton (N.) they had not any. During this storm the ther. here fell 10 degrees, viz., from 59° to 49°.

BANBURY.—T S on 4th and 13th; H on 14th; T with H on 28th.

WISBECH.—From the 4th to 12th fair, the rest of the month cold and unsettled. The corn crops much laid by the R and wind on the 26th; the harvest will be at least a week later than during the last five years. T on 15th.

CULFORD.—T on 2nd, 13th, and 28th. Month generally dull and cold for the season. Great fall of R on Friday, the 26th, commencing a few minutes before 6 a.m., and never slackening till 6 p.m., when the fall was found to be 2·07 in.

TAUNTON.—Bar. fell 1 in. between the 9th and 15th.

ORLETON, WORCESTERSHIRE.—A fine month upon the whole, but the temp. below the average, with a prevalence of N. and E. winds. Max. temp. on four days only reached 76°, and the nights were generally cold. On the morning of the 28th the grass min. fell to 33°·8; distant T heard on 4th, 13th, and 14th. At the end of the month the land became very dry.

WIGSTON.—Temp. very variable and ungenial for vegetation. Harvest backward; hay harvest abundant and well secured.

MANCHESTER.—T on 13th and 18th. Excessively heavy R on the 16th.

YORK.—T at 4 p.m. on 10th.

NORTH SHIELDS.—Yellow turncap lily in flower on 1st. A cloudy month, with R much above the average. T S on 18th.

SEATHWAITE.—Only 3 days with more than 1 in. of R, but total fall much above the average. Hot from 6th to 12th, rest of month cold and cloudy. T S on 17th.

WALES.

ABERCARN.—Rainy weather from the 2nd to 5th, then fine and generally clear to the 14th, when a period of rainy weather again set in up to the 23rd; afterwards fine and calm to the end of the month. On the 15th there was a heavy downpour, yielding 1·74 of R in 9 hours. Very little T during the month.

HAVERFORDWEST.—First fortnight warm and pleasant; daily temp. above 70°. with warm nights. No R till the 4th, when ·45 in. fell; drought much felt, On the 13th heavy R, with T and sheet L, following a red sunset with dark lurid clouds in N.E., and being followed at 1.30 a.m. by a fine lunar rainbow. On 15th (St. Swithin) 1·27 in. fell nearly in one fall, at least in the 24 hours.

CEFNFAES.—Temp. low during the month; the last fortnight the evenings and nights have been very cold, with slight frosts.

SCOTLAND.

DUMFRIES.—With the exception of 3rd and 4th, the weather dry to the 13th, thence to the 24th only one day without R; the rainfall on the 23rd excessive, such a heavy fall not known for years. The close of the month dry, but cold for end of July. Harvest will be three weeks (at least) later than that of last year, but green crops are much heavier. 83°·5 in the shade on the 11th. T on 11ih & 13th.

SILVERBUT HALL, HAWICK.—A singularly beautiful rainbow at sunset on the 4th. T S on 10th, T on 11th and 14th. The copious rains have been most beneficial to the crops, which were suffering from the drought of June. Oats were much laid by the heavy rains of the 21st and 22nd, but they have got up their heads again, and they, with the other crops, now promise abundance.

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AUCHENDRANE.—On the forenoon of the 11th distant T was heard in the W. about 8 p.m.; the storm came very near from the S., and the L glare was intensely red; about 10.30 the L flashed in all directions, and the roar of the T was almost continuous from that time till 8 a.m. 12th, about which time the L rod on the house was struck; the noise was terrific, and at the same moment a neighbouring silver fir, 90 ft. high and 18 ft in girth, was shattered to pieces, only leaving a bare and fractured stump rising from the ground 30 ft. There has been no such night of electric disturbance in the memory of the present generation. The storm extended over a large district, especially towards the S., but with less violence. On 22nd, day of greatest rainfall, the wind from calm became N. and N.E. moderate; the sky was densely overcast with clouds from S., and afterwards E.

DEANSTON.—Last fortnight very cold from E. winds, which blew on 22 days.

LOGIERAIT.—Warm and dry from 1st to 11th, thence to the 25th heavy R, with a greatly reduced temp.; afterwards warm. Crops promise well.

BALLATER.—An unusually cold and stormy month. The amount of R much above the average. Pasture for cattle exceptionally luxuriant, but sunshine now much wanted to ripen the crops, which must be late. T on 10th and 12th.

ABERDEEN.—The early part of the month was fine, warm and genial, but from about the 18th the month was cold, wet, and ungenial. Temp. nearly 3° below the mean of July for the last ten years. Rainfall more than 1 in. above the average.

CULLODEN.—From 1st to 15th only two days on which R was measured, thence to end of month R on every day but four. T on 9th, 12th, and 13th.

FORT WILLIAM.—T at 8 a.m. on 12th, and T S from 1 to 2 p.m.; T till evening. 22nd to 27th, cold N. winds; fires comfortable.

PORTREE.—The month on the whole has been favourable, although generally very cold, from the prevalence of N. and N.E. winds, and dry, so that the peats have been well secured for winter fuel. Crops look well; the hay generally is abundant, but still unsecured; oats and barley look well, but will be very late; there will be no harvest, I think, before October; potatoes are abundant, but the blight has made its appearance amongst them. Very loud peal of T at 2 p.m. on 12th.

LOCHBROOM.—The month has been very cold and wet. A terrific T S on the afternoon of the 11th. The weather at the end of the month beautiful, and though late, the crops look very promising, and with fine harvest weather there is every probability of abundance both for man and beast.

SANDWICK.—July has been dry and very cold, having been colder than any July for the last 40 years, except that of 1837, when the mean was 50°·6, while this year it was 51°·4, the mean of the last 40 years being 54°·8. The cold was caused by the prevalence of N. wind (21 days); it was also very cloudy, though during the last 11 days there was no appreciable quantity of R.

IRELAND.

DOO CASTLE.—The heavy rains of this month, alternating with the great heat, have much improved the crops and meadow land. From 25th to the end of the month weather delightful. The myriads of small brown snails which swarmed on grass walks, and have been so destructive to vegetables for the last two months, have entirely disappeared. Extraordinary landslip on the 13th in the west of this county (Mayo), about 40 acres of surface soil slipping off into the Atlantic.

OWENDOON.—The heavy rainfall of this month has been most opportune.

[In *Meteorological Magazine*, No. 18, p. 74, OWENDOON.—The remarks from "Considering" to end belong to Doo Castle.]

WARINGSTOWN.—The first ten days and the last seven were fine and warm, during the intervening fortnight a large quantity of R was measured daily except on 19th; the fall here of the 15th was unprecedented, though the 23rd and 24th seem to have exceeded it elsewhere. On the night of the 11th a most terrific T S, and T continued at intervals for several days. 23rd, heavy rains at night, causing inundations all over the country. Crops generally looking well.

LECKPATRICK.—From the 11th to the 23rd constant R, rendering the saving of hay a work of difficulty. Complaints of turnip crop from the wet. I never remember two entries of three figures in one month before. Wind generally N.E.

[In consequence of the unusual space occupied by the rainfall of July 26th, several articles are unavoidably postponed.—ED.]

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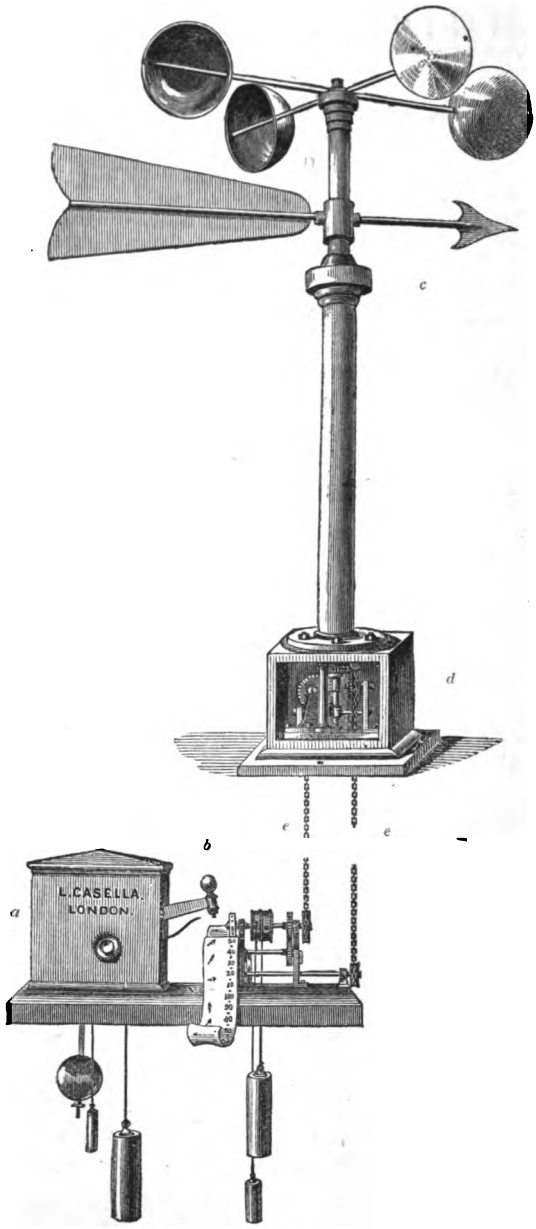
CASELLA'S EMBOSSING ANEMOMETER.



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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

XX.] SEPTEMBER, 1867. [PRICE FOURPENCE. or5s. per ann. post free.

ANEMOMETERS.

(Continued from page 66.)

WE have on the present occasion to describe the different arrangements which have been devised for rendering the velocity or pressure and direction of the wind self-recording, by which is understood not merely the registering of the total velocity or maximum pressure, but the automatic recording of the strength and direction of every breeze.

Of late years preference has been given to velocity instruments on the principle of Robinson's cups, described in our last article. We will, therefore, proceed to notice them first.

The Beckley-Robinson, otherwise called the Kew Anemometer, was, as its names imply, a modification of Robinson's arranged by Mr. Beckley, of Kew Observatory; it was described by him in the *British Association Report* for 1858, where will be found ample working drawings of the instrument. It consists of four Robinson's cups, as on page 64, but twice the size there described; these, by means of clockwork, turn a cylinder, round which is a single spiral of metal, which, pressing on metallic paper, produces a continuous tracing of the rate at which the wind has passed; a couple of fans or windmill governors, as they are sometimes called, are employed to record the direction, their motion being communicated to a cylinder pressing on the metallic paper side by side with the velocity pencil, the paper itself being carried by a clock under the pencils at a uniform rate. Several of these instruments have been made by Mr. Adie, of the Strand, for the British and other Governments, and they have given the highest satisfaction. The price is necessarily high (£65), but a smaller instrument on the same model has been produced by Mr. Adie at £21, which we believe to be a thoroughly serviceable anemometer. Both these require a fresh paper, and to be wound up daily.

A novel mode of registering the revolution of the cups has been adopted at Greenwich, but it gives velocity alone, and has not hitherto been copied elsewhere. The action is very direct, and we should imagine that a direction record might be combined with it, with ease, advantage, and economy.

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The last velocity anemometer which we have to notice is Casella's, whereof we give an illustration, and which is thus described :—

"The paper employed is a narrow strip, wrapped round a small attached roller, from which it is drawn, and embossed on one edge by the action of the rollers, as shown in the sketch.

"The rollers are divided to represent single miles ; they are figured at every ten, and one revolution shows the wind to have travelled fifty miles.

"The clock (*a*) raises the small hammer (*b*) which falls once in every hour, impressing the other edge of the paper with a small arrow, whose movements are identical with the larger one at the top, and thus shows the exact direction of the wind at the time, and the distance between the arrows shows its rate of speed during each hour.

"The paper is of sufficient length to last six weeks, and the clock may be wound up daily or weekly, as desired.

"The projection (*c*) contains metal balls, which firmly support the top and give freedom of action. The box (*d*) of cast iron, contains the stronger portion of the wheel work, and has holes in the flange for screws or nails, by means of which it is easily fixed to the roof of a house, or on a pole in a garden or field, or by the sea-side.

"The chains (*e e*) act on *improved* rollers, over which they *cannot pass* without turning them, and are brought into connection with the clock work and registering parts, placed in a room or box for protection, at any vertical distance from the base (*d*), from three to twenty-five feet.

"In size, the height of the upper part is 39 inches from the base of the box (*d*), the diameter over the cups is 24 inches, and its strength and general construction such as to bear the vicissitudes of the severest storm. Where frequent absence is requisite, or in places of difficult access, the little attention required in using this instrument can hardly be over-estimated. The action of each is tested, and guaranteed to give precisely the same rate of speed as that of the Standard Anemometer of the British Association at Kew."

The cost of this instrument is £32.

Abstracts of Meteorological Works. No. II.

(Saussure's Hygrometry, continued from page 68.)

PUBLISHED A.D. 1783.

We need not follow in detail the chapters devoted to The examination of hair hygrometers ; Is it moisture alone that elongates the hair ? Hygrometrical effects of heat on air and on hair ; What correspondence exists between hygrometrical degrees and the quantity of water in the air ? Effect on the hygrometer of rarefied and of condensed air ; What is the effect of agitation of the air on the hygrometer ? His experience and experiments on this head are worthy of notice, the facts being briefly as follows :—Saussure often suspended his hygrometer 4 ft. above the ground in the middle of a large plain, waited until it took exactly the humidity of the air, and observed afterwards its momentary variations. We know that there are days when the air is calm, or no violent or decided wind agitates it, but nevertheless in a place perfectly open there arise from time to time slight breezes, which give a

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momentary agitation. He invariably remarked that these slight breezes, from whatever quarter they came, caused the hygrometer to go towards dry sometimes 1°, sometimes even 2°; after which, when the air became calm, it retreated little by little to the point at which it was previously. Reflecting that these puffs arising all at once in the middle of a calm cannot surely come from far, that they are in fact but portions of the surface air of the same plain, compelled by a momentary rupture of equilibrium to change places; in such a plain when the air is calm it may be assumed that the whole was of nearly the same humidity. Why then should these breezes *always* give drier indications. Returning home, he suspended the same hygrometer in the middle of a room, closed the doors and windows, sat down 6 ft. from the hygrometer, over which he had suspended a large screen, waited quietly until he was certain that the screen and hygrometer were in the same state as the air of the room, and had taken up all possible effect from the presence of his body, then, without changing his position, he agitated the screen rapidly (like a fan); at the end of eight or ten minutes he found the hygrometer indicated about three quarters of a degree drier. From subsequent rough experiments, Saussure decided that these effects were due to the mingling of air from a higher level, which he assumed to be always drier. We think the point open to further investigation, the relation of aspirated and ordinary dry and wet thermometers being, we believe, only a partially investigated question.

The third essay, devoted to evaporation, is an excellent *résumé* of the subject, far more advanced than many would have expected from the date of publication. For instance, when speaking of evaporators, he ridicules the idea of evaporation from a small vessel of water in a garden representing that of a large water surface like a lake or sea, and says, "in order to do this fairly, we should have the vessel floating even on the surface of the sea, and with the water as near as may be at the same level." Then he discusses the most suitable size and form for evaporators, arriving at the conclusion that the result is the same if they are of such a size that the water is at the same temperatures. He proceeds to quote Richman's suggestion that, with a view to keeping the water surface nearly at a constant level, the evaporator should be connected with a second vessel of larger area and covered over. Chapter VI. opens with a statement which, if true in 1783, is certainly not true in 1867, namely, "Everybody knows that ice is subject to evaporation;" *everybody* does not know it, though probably all our readers do; we need, therefore, only mention that he not only proves it in various ways, but also shows that the rate of evaporation is proportional to the humidity of the air.

Having already dwelt upon this interesting volume at great length, we can only add a few fragments from the fourth and last essay. For instance, "It is the coldness of the upper regions of the air which retains and imprisons the water which nourishes the surface of the earth." Again, he almost stumbles on the theory of dew, in the following paragraph:—

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"Dew, which we may regard as a species of rain without clouds, is explained in the same manner, nevertheless it is sometimes accompanied by fog, and even this vapour which renders the air slightly thick when the dew falls, is produced, probably, by some of the vesicles which are formed when cooled air is depositing its superfluous humidity. But I leave to Mr. Pictet the details of the explanation of dew and of the new and singular thermometric phenonema which he has observed at the instant of its formation."

Again, he criticises Bouguer for limiting the altitude of clouds to 8,000 ft., and rightly pronounces this far too low, though he surely errs in the contrary direction in saying "they may consequently exist at 877,500 ft., or 168 miles!"

From the many excellent suggestions in the closing chapter we must select in conclusion the following, which is as necessary now as then, if not more so :—

"In many respects a *diaphanometer*, that is to say, an instrument which will measure the transparency of the air, would be an important addition to meteorological instruments, and one I believe not yet suggested. This would help to estimate the quantity, and aid, perhaps in recognizing the nature of that singular exhalation which diminishes the transparency of the air and gives it a bluish colour, even in very dry weather, and when the air is certainly free from aqueous vapour in its vesicular form."

REVIEWS.

An Explanation of the Popular Weather Prognostics of Scotland on Scientific Principles. By the Rev. CHARLES CLOUSTON, Minister of Sandwick, &c. Large 8vo., 53 pages.

THE sayings, proverbs, or axioms about the signs of coming weather were the foundation of meteorology; and, whether proved to be true or false, they will doubtless endure as long as any other proverbs. Curiously enough, they serve to show the long line of descent connecting all races of men in some way or another; for they are everywhere similar in import, as recorded in the writings of the earliest authors, sacred and profane, in the Old and New Testaments, in the ancient poems of Greece and Rome. In the *Diosemeia* ("Signs of the Sky") of the Greek poet Aratus, we find all our popular saws about the weather, and yet the poem was composed more than 2,000 years ago, being itself chiefly a collection from earlier writers—Hesiod, Aristotle, and Theophrastus.

Now, although the duration of opinions is not a conclusive proof of their truth, yet, in the present instance, as every generation has had the opportunity of testing their accuracy and value, they would soon have ceased to be handed down if they had not been found to contain some measure of truth and foundation in fact.

Indeed, when instruments were more expensive and less understood than they are in our time, this class of observation was the only guide the farmer possessed; and even at the present day, as Admiral FitzRoy suggested, every prudent observer will combine observations of the elements as derived from the appearances of the atmosphere and the country, with such indications as he may obtain from instruments, for he will find that the more accurately the two sources of knowledge are

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compared and combined, the more are the probabilities of arriving at the truth increased, if not insured. Moreover, considering the uncertainty and difficulties in the way of prognosticating the weather in our country many hours in advance of the change, we need hardly say that the eye should be always ready to detect the slightest indication of any change; and that constant and careful attention to these points will prove of infinitely more use to the farmer than all the empirical predictions extant.

But such a class of weather-indicators as are afforded to the careful observer, without the aid of scientific instruments, are valuable only as far as they are founded upon physical facts, and are in accordance with the observed laws of nature; such, in short, as the why and wherefore of which we can explain, showing us not only that such and such will follow certain appearances, but also *why* such appearances as we observe do precede certain changes of weather.

Doubtless the most reliable information on this head is to be found in Sir Humphrey Davy's "Salmonia," and the explanations of this acute philosopher have been laid under contribution by all who have since undertaken to give the why and because of our popular prognostics.

The present explanation refers to a collection of the Popular Weather Prognostics of Scotland, by Dr. A. Mitchell, published a few years ago when the Marquis of Tweeddale offered a prize of a gold medal, a piece of plate, or 20 guineas, for the best scientific explanation of them. We are informed that the prize was duly awarded, but the successful work has not been published, which is to be regretted, since under the circumstances, we may suppose that it was a complete exposition of the curious topic. Perhaps we should state that Mr. Steinmetz, in his "Sunshine and Showers," (recently noticed in our pages), devotes a long chapter to the explanation of this very collection, and so between these two authors, perhaps we have as much as can be said on the subject.

Mr. Clouston does not appear to put much faith in *lunar* prognostics; he says:—

"Ever since I considered the subject, I have been of opinion that changes of weather are not more probable a few days after full or new moon than at other times; and with regard to 'lying on her back' being a prognostic, it seems too absurd to require refutation, for astronomers could tell us the angle at which she would lie a hundred lunations hence, though no one could pretend to give us a very correct description of the weather immediately to follow. It depends on her position when first seen, and as she appears to lie more on her back *when seen early*, or a little above the sun, than when she has made considerable progress in growth and from the sun."

We are as yet very far from being converted to the theory of lunar influence on the weather; but still it should be known that recent investigations instituted by Mr. Glaisher seem to open the question once more with some chance of arriving at definite conclusions on the subject. In his interesting paper on "The Influence of the Moon on the Direction of the Wind,"* this scientific meteorologist avers that

* Proceedings of Meteorological Society, March 20, 1867.

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"from the discussion of the observations [extending over seven years], it seems that when the sun and moon were in and near conjunction the air was less frequently calm; the duration of the north wind with its east compounds was less frequent; the south wind with its west compounds was more frequent than when the sun and moon were in and near opposition. From this it would seem that the position of the moon in respect to the sun has exercised an influence on the direction of the wind in these years."

Now, as wind and weather go together, it would seem that the popular belief is becoming avenged on the learned authorities (Arago, among them), who have hitherto ridiculed it as unfounded in fact and reason. Oddly enough, this very saying about the moon lying on her back, which Mr. Clouston thinks ridiculous, is confirmed by Mr. Glaisher's investigations. It occurs only at *new* moon, and this is the period, according to Mr. Glaisher, that a *sou'wester* will blow if at any time, and everybody knows what sort of weather this wind generally makes.

It is curious to find that the adage is at least as old as Aratus (2,000 years ago), and that Mr. Glaisher should have been destined to prove its correctness. Aratus not only refers the south wind to the moon's *lying on her back*, but the north wind to her upright *nodding*. With all our vaunted scientific progress, the influence of declination, thus early pointed out, has we believe, never been thoroughly tested.

Here is the axiom of Aratus:—

Εἰ δέ κέν οἱ κεράων τὸ μετήορον εὖ ἐπινεύοι
Δειδέχθαι βορέω· ὅτε δ' ὕπτιά ῃσι, νότοιο*

Respecting the saying that "rain with a south-east wind is expected to last for some time," Mr. Clouston observes:—

"This saying is very common, but I was much at a loss to account for the fact till the idea now prevalent regarding the winds came under my notice, as there is no great mass of water in a south-east direction to send us its evaporation; but the south-east wind is now viewed as a combination of a polar and tropical current, deflected in this direction by the rotation of the earth, and no mixture of currents is more likely to supply us with continued rain than this—the cold polar current condensing the moisture in the watery tropical one, and causing rain."

This is Admiral FitzRoy's view, but it appears to us that the explanation given long ago by Luke Howard was equally rational:—

"Vapour brought to us by such a wind [S. or S.E., to be decomposed by the prevalent N.W., W., and S.W. winds] must have been generated in countries lying to the south and east of our island. It is, therefore, probably in the extensive valleys watered by the Meuse, the Moselle, and the Rhine, if not from the more distant Elbe, the Oder, and Weser, that the water rises, in the midst of sunshine, which is soon afterwards to form *our* clouds, and pour down in *our* thundershowers. And this island, in all probability, does the same office for Ireland—nay, the eastern for the western counties of South Britain . . . . . After nearly

---

* *Diosemeia*, 794. "When her upper horn nods well forward, expect the north wind; but when she lies on her back, the south wind.

"When the moon lies on her back,
Then the Sou'-west wind will crack;
When she rises up and nods,
Then North-easters dry the sods."

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nine days wet weather, attended as usual with mixed winds, in our district, upon the wind changing from S.E. to N.E., it became fair with us; and on the same day (26th May, 1817) a rain of three days and nights commenced in the country east of the Upper Rhine about Stuttgard, so heavy as to produce a serious inundation. In the meantime we had no rain, though the barometer was very low, and the change of the wind above mentioned had been attended with thunder. The rain ceased in those parts upon the evening of the 28th, and on the next two days it rained again with us."*

"Easterly gales without rain during the spring equinox, foretell a dry summer." On this axiom Mr Clouston says:—

"The *new* views on this subject are very important indeed. It will be most advantageous if we can make sure, according to the theory of Mr. de Boulay, that 'extraordinary weather at the vernal equinox, is followed by a repetition of that weather, and of the aërial movements which caused it, during the succeeding summer.'"

Now, if we admit the importance of these views, they are certainly not *new*. It was Dr. Kirwan who long ago propounded them from observations made during the series of years from 1677 to 1789, and they were quoted and verified by Luke Howard in 1808 (vol. ii., 41). Dr. Kirwan's rules are—(1) when there has been *no storm* before or after the vernal equinox, the ensuing summer is generally *dry*, at least four times in six; (2) when a storm happens from an easterly point on the 19th, 20th, or 21st of March, the succeeding summer is *dry*, four times in five; (3) when a storm rises on the 25th, 26th, or 27th March, and not before, *in any point*, the succeeding summer is generally *dry*, four times in five; (4) if there should be a storm at S.W. or W.S.W., on the 19th, 20th, or 22nd of March, the succeeding summer is generally *wet*, five times in six.

Dry summers, says Kirwan, are the consequence of *uniform* winds, from whatever quarter they may blow; as *wet* summers are of variable winds, particularly in opposite directions. Now, southerly winds are most frequently accompanied with rain in most parts of Europe, at least, and probably in most parts of our hemisphere, but northerly and easterly, with clear, dry, and serene weather, and, as Luke Howard observes, it seems reasonable to suppose that the wind which is to prevail during the summer, *may most frequently set in with the vernal equinox*. In one case we get a *tropical* summer, incessantly pouring, in the other a *polar* summer, as most strikingly exemplified this year, when during June and July we sweltered on the south side of a street, and shivered on the north—whilst the sun shone—with a huge "daily range" of the thermometer. Kirwan's second maxim was verified in spring. Last March began with N.E. or N.N.E winds, continuing with scarcely a change to the 17th when the wind advanced to a point or so to the S. of E., but returned to E.N.E. on the 19th, and so continued to the 21st; stormy, with a 12-pound pressure from S.E. on the 22nd. Consequently, the summer should have been dry, which, however, it was not.

Mr. de Boulay's prediction for this year is not clearly expressed as to whether it will be wet or dry, but he distinctly says that "the

* Climate of London, i., 122.

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coming season in Great Britain does not promise to be a bountiful one as regards the yield of cereals." (*Mark Lane Express*, April 29th).

The study of periodic phenomena will throw great light on practical meteorology, so that in time we may hope to have something like a weather almanac not destined to be right by chance, and wrong on principle.

No one is in a better position to aid in this development than Mr. Clouston, a veteran meteorologist of 40 years' experience, and furnished with the best instruments—among the rest, one of the self-registering anemometers belonging to the Government. Not only should he be able to test the periodic variations of temperature, but especially the grand question of lunar influence on the weather, as apparently involved in the winds that may characterize not only her mere *phases* (which the vulgar note,) but her positions in declination apogee and perigee, as shown by the *Nautical Almanac*, with reference to the sun's all-important declination. If Mr. Clouston will institute this process, *de lunatico inquirendo*, we doubt not that something will come of it, and shall always endeavour to find a monthly place for his results in the *Meteorological Magazine*. *Verb Sap.*

Report on the unusual intensity of the Frost of December, 1860, *and January*, 1861, *with its injurious effects on Trees, Shrubs, Pines (coniferous), &c.; and a Comparison between the great Cold of this Period and that experienced in the severe Winters of* 1837-8, 1841, *and* 1855; *with some Remarks on the intense Frost of January in the present Year* [1867.] By DUNCAN FORBES, of Culloden. Aberdeen: G. Clark & Sons. Large 8vo, 30 pages.

NOTWITHSTANDING its lengthy title, this is a capital pamphlet, giving in double columns the minimum temperatures at the principal gardens and nurseries in the North of Scotland, and the coniferous pines, &c., which have borne those temperatures without injury. This able report should be in the hands of all who take interest in the ornamentation of our parks by the acclimatization of the rarer pines; botanists and meteorologists here meet on common ground, and each has much to learn from the other. We presume not to dictate on botanical matters, but find even in this pamphlet ample proof that it is not alone intensity of frost that determines its destructive power; the previous condition of the plants, the dampness or dryness of the soil and of the air, and the duration of the low temperature, these, and perchance other conditions which we know not of, all have their influences; and such labours of love as this now under notice must be pushed on, not alone in one district, or by one person, however zealous, but in different districts and by many minds, and then without doubt the practical benefits conferred by the present publication will continue to extend in ever widening circles. Just as a type of the information contained in the pamphlet, we may state that particulars are given of 21 localities where specimens of the *Wellingtonia Gigantea* were exposed to temperatures of which several were near zero, and the lowest was —8°, and yet in every case they escaped uninjured.

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Everybody's Weather Guide. By A. STEINMETZ. Reeve. Large 8vo, 24 pages.

A WELL designed epitome of the weather wisdom of the present day, which will we think enable "everybody . . . to form a probable opinion of coming weather;" but Mr. Steinmetz's readers will be far ahead of the rest of us if they are by it "enabled to know when they are likely to need umbrellas and when they may leave the encumbrance at home, although the sky be overcast and cloudy." Mr. Steinmetz is the most likely man to achieve this, and we would not presume to suppose he was ever caught in a shower, though our own carelessness or want of skill often places us in that predicament. The author of the "Manual of Weathercasts" and of "Sunshine and Showers," comes before us crowned with the laurels they have won for him; he has succeeded to a great extent in popularizing meteorology; may he be equally successful in the matter he has now taken up.

Reference is made in the body of the pamphlet to a set of meteorological instruments prepared Mr. Pastorelli, of Piccadilly, and on the cover an engraving is given of the stand which is supplied with them. We have made some enquiries on the subject, and find that the set consists of *barometer*, oak and ivory, (certified by Mr. Glaisher as having no greater error than 0·02,) with double scale thermometer; *dry and wet bulb* thermometers, divided on their own stems, metal scales; *maximum and minimum* thermometers, similarly mounted; *rain gauge* and *thermometer stand*; the last alone requires altering, by the addition of wings to keep off the morning and evening sun. The price of the set is £5 or £5 5s., we forget which; but either is low, considering the quality of the instruments. We should much prefer a metal scale barometer, even if the set cost £1 more, but with the certificate above mentioned, the wooden barometer is obviously correct enough for all ordinary purposes.

HEAVY RAINFALL IN THE UNITED STATES.

For the past three weeks the Atlantic coast of the United States has been visited by the most heavy and long-continued rain storms. These storms have prevailed all along the coast from Boston to Savannah, and in the interior as far back as the Alleghanies. An enormous amount of water has fallen, and for the month of August in this part of the world the rainfall has been unprecedented. Between the 1st and the 15th of August inclusive the rainfall at Philadelphia was 14·56 inches, of which no less than 6·68 inches fell on the 15th. These heavy rains, which have been seldom accompanied by thunder, a very strange circumstance for the season, have generally been in the form of drenching showers of short duration, coming at frequent intervals. On August 15th the rain fell in torrents and was more like the bursting of a waterspout than anything else. The floods made the streets impassable, and put a stop to all business, and this effect is not alone reported from this city, but from New York, Baltimore, Washington, and elsewhere. On August 16th, owing to the great freshets in the streams, there was scarcely a railroad or highway passable in New York, Pennsylvania, New Jersey, Maryland, or Virginia. Our great rivers ran as mountain torrents, carrying everything before them, and overflowing all the low portions of the cities. Scarcely a telegraph wire was in operation, and the damage to roads and canals and other property is almost incalculable. Of course, such drenching rains have had a bad effect upon the few crops in the ground at this late season; and the great fall of water for August is the subject of universal remark.

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AUGUST, 1867.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Date.	Days on which 01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of nights below 32°.
			inches	inches.	in.							
I.	ENGLAND.	Camden Town	2·63	— ·01	·89	19	10	88·2	14	40·9	3	0
II.		Staplehurst (Linton Park)	1·55	— 1·16	·41	6	10	90·0	14	44·0	2	0
,,		Selborne (The Wakes)	2·43	— ·74	·54	5	11	79·0	14	39·5	1	0
III.		Hitchen	1·86	— ·49	·58	6	12	80·0	14	40·0	2	...
,,		Banbury	2·75	+ ·62	1·39	15	12	83·2	13	41·0	8	0
,,		Wisbech	2·15	...	·59	6	12	88·6	14	42·8	3	0
IV.		Bury St. Edmunds (Culford)	1·49	— ·95	·52	6	7	87·0	14	36·0	2	0
V.		Calne	3·07	...	1·33	15	11	86·0	13	42·5	27	...
,,		Plymouth (Goodamoor)	1·93	— 3·06	...	...	...	83·0	...	43·0	...	...
,,		Barnstaple	2·06	— 2·13	·35	29	14	85·6	14	47·0	22	..
,,		Taunton (Fulland's School)	1·47	— 1·20	·38	5	12	94·0	12	45·5	20	0
VI.		Shrewsbury (Highfield)	·79	— 2·10	·30	31	12	88·0	13	...	...	...
,,		Tenbury (Orleton)	2·19	— ·69	·61	31	16	86·3	13	40·0	28	0
VII.		Leicester (Wigston)	2·18	— ·02	1·24	16	10	90·0	13‡	41·0	27	0
,,		West Retford	...	...	..	...	..	...	...	...	...	...
,,		Derby	4·21	+ 1·61	2·11	19	15	87·0	13	46·0	7, 22	0
VIII.		Manchester	1·41	— 2·09	·27	15	16	90·0	13	45·0	27	0
IX.		York	4·34	+ 1·63	2·40	15	9	83·0	13	47·5	22	...
,,		Skipton (Arncliffe)	4·05	— ·89	·95	15	15	71·0	14	45·0	27	0
X.		North Shields	2·35	— ·50	·70	15	13	73·0	13	46·2	7	0
,,		Borrowdale (Seathwaite)	13·05	— 1·03	1·73	6	21	...	...	...	...	...
XI.	WALES.	Abercarn	1·76	...	·35	6, 8	12	83·0	14	47·0	28	0
,,		Haverfordwest	3·45	— 1·43	·96	9	14	80·5	13	44·0	12	0
,,		Rhayader (Cefnfaes)	1·24	— 3·42	·30	17*	13	86·0	...	42·0	..	0
,,		Llanberis (R. Victoria Hotel)	3·78	...	·68	5	16	...	...	...	...	...
XII.	SCOTLAND.	Dumfries	3·36	— ·52	·47	12	20	82·0	13	43·5	27	0
,,		Hawick (Silverbut Hall)	2·31	...	·25	6	20	...	...	...	...	...
XIV.		Ayr (Auchendrane House)	3·69	— ·28	·49	30	22	76·0	12	41·0	27	0
XV.		Otter House	5·06	— ·96	·99	7	16	75·0	14	43·0	1	0
XVI.		Leven (Nookton)	2·04	— ·95	·57	20	..	73·0	27	43·0	27	0
,,		Stirling (Deanston)	4·48	— ·14	1·36	20	20	76·0	14	41·0	27	0
,,		Logierait	3·32	...	1·61	20	14	...	...	...	...	..
XVII.		Ballater	2·85	...	1·08	20	13	81·0	14	34·5	2	0
,,		Aberdeen	3·56	...	·72	20	19	75·0	14	43·6	27	0
XVIII		Inverness (Culloden)	2·03	...	1·33	31	6	72·0	13	45·4	2	0
,,		Fort William	4·75	...	·59	20†	25	...	...	...	...	...
,,		Portree	6·32	— 1·13	1·39	24	18	74·0	14	38·8	1	0
,,		Loch Broom	1·86	...	·46	20	15	...	...	...	...	...
XIX.		Helmsdale	1·95	...	·84	20	10	...	...	...	...	...
,,		Sandwick	1·72	— 1·99	·34	20	15	69·2	12	45·0	20	...
XX.	IRELAND.	Cork	2·29	...	·44	31	18	...	...	...	...	...
,,		Waterford	3·35	— ·10	·80	30	22	77·0	14	49·0	27	0
,,		Killaloe	4·70	— ·23	·96	19	23	80·5	13	42·5	27	0
XXI.		Portarlington	2·79	— 1·71	·47	14	22	74·0	13	43·0	27	0
,,		Monkstown	1·53	— 1·68	·40	31	15	77·5	13	40·0	1	0
XXII.		Galway	4·39	...	·48	25	22	77·0	1, 14	47·0	27 ‖	0
,,		Bunninadden (Doo Castle)	2·78	...	...	...	...	...	...	...	..	...
XXIII		Bawnboy (Owendoon)	3·85	...	·68	22	21	81·0	13	21·0§	2	2
,,		Waringstown	2·72	...	·84	30	18	82·0	13	41·0	6	0
,,		Strabane (Leckpatrick)	3·05	...	·54	30	21	77·0	12	40·0	2	0

* And 30th. † And 24th. ‡ And 14th. ‖ And 29th.

+ Shows that the fall was above the average; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

CAMDEN TOWN.—L from 9 p.m. on 19th almost without intermission till 3 a.m. on the 20th; 14th very hot and unusually damp with such great heat.

LINTON PARK.—T S on 14th, 15th, and 20th, and but very little L at any other time; no high winds, and the weather on the whole favorable for harvest operations.

BANBURY.—Mean temp. slightly above the average for August; harvest about two-thirds completed. T on 15th, T S on 19th and 20th.

WISBECH.—Generally fine month, with temp. above the average; T S on morning of 20th, but not heavy.

CULFORD.—A month of favourable weather for the harvest, which has in many instances finished with the month; T on 19th.

TAUNTON.—T S 9·50 p.m. 19th. The heat on the 11th, 12th, and 13th was very oppressive; it was like a heavy heat wave passing through the valley of Taunton Deane.

ORLETON.—T S from evening of 19th to morning of 20th.

DERBY.—We were visited on the morning of the 19th with a T S of unusual magnificence, commencing about 1 a.m. and continuing for three hours; 2·11 in. of R fell but as there was no wind the corn was not laid to any great extent, and though we have had R on 15 days it seems scarcely to have interferred with harvest operations.

YORK.—Heavy R from 9 p.m. on 19th to morning of 20th, equal to 1·48 in., and 20 hours steady R on 15th, equal to 2·40 in.

WALES.

ABERCARN.—Distant T S, with very vivid L, to the S. on 20th. A very calm month, generally dry and warm, temp. very even but rather higher, towards the end than the beginning of the month.

HAVERFORDWEST.—Till the 11th fine, air pleasant, moderate heat, with light R chiefly at night, from that time to the 15th very warm indeed, remainder of the month warm and pleasant, the R falling mostly at night, there were many fine days, and on the whole fine harvest weather.

CEFNFAES.—Excessively hot on 12th, 13th, and 14th.

SCOTLAND.

DUMFRIES.—The first four days very fine, the rest of the month showery. Temp. both of day and night above that of last year. On the 24th the night temp. was 60°. Harvest commenced on 8th, but not general till the 26th. The weather has been unfavourable for harvest operations. Barley, average crop; wheat fully an average; oats good and above the average, and potatoes considerably above the average, but some disease appearing.

HAWICK.—Leading hay first four days; falling stars on the 10th; T S on 12th; first barley cut on the 20th, but it will take another week's ripening weather before the harvest will be general in this district.

OTTER HOUSE.—A cloudy wet month, not favourable for harvest; the cutting of barley will commence here next week if the weather is propitious.

DEANSTON.—Severe T S with much L and heavy R on 20th.

LOGIERAIT.—A genial month. Severe T S on 20th. Harvest not begun.

BALLATER.—From the commencement of the month the weather has been a great improvement on that of July, the temp. being 2° higher; on the 9th there was a remarkable H shower (in the afternoon) pieces of ice ½ in. in diameter falling in large quantities; a single peal of T occurred in this locality at the same time; a smart T S with much L and heavy R on the afternoon of the 20th.

ABERDEEN.—Heavy T SS on 9th and 20th.

CULLODEN.—Heavy T S on 20th, with 1·33 in. of R in five or six hours.

PORTREE.—Rather a wet month, but drier than August usually is in this locality; the crops have made good progress; there will be a good supply of straw and hay, but fully a month later then usual; there can be no shearing before October.

LOCHBROOM.—This month on the whole has been a grand one, and another such would finish a most bountiful harvest of all kinds. On the morning of the 20th, between 1 and 2 a.m., a severe shock of an earthquake was felt here, it

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seemed to have travelled from S.E. to N.W., it shook the houses and broke the crockery therein, and pieces of rock fell from the hills from its effects.

SANDWICK.—August has been fine and dry, the driest since 1856; the latter part of the month was warmer than the mean, and very pleasant. Auroræ on 25th, 26th, and 27th. Lunar halo on 2nd.

IRELAND.

DOO CASTLE.—First half of month very fine, latter part broken, with very few whole fine days; the atmosphere was close and I should say favorable for the production of caterpillars, which have destroyed the cabbages in this locality; I have employed boys to pick them off, but find them so numerous as to bid fair to destroy all before them.

OWENDOON.—T S on 13th. The potatoe blight made its general appearance early in this month, but the tubers still appear sound; the crops have all much improved; scarcely any apples to be seen; wall fruit scarce. Frost on 2nd and 18th.

WARINGSTOWN.—A fine seasonable month except the last three days; harvest ripening unusually fast, reaping will commence much earlier than was expected.

LECKPATRICK.—A fine month; has ripened the corn in good time; harvest not begun, but promises to be abundant.

TEMPERATURE IN THE SHADE AND IN THE SUN.

To the Editor of the Meteorological Magazine.

SIR,—The extraordinary accounts in the papers of the heat in the shade and in the sun having attracted my attention, I was induced to make some experiments, in order to form an opinion of what these terms meant. With this view, I selected four thermometers, by Negretti and Zambra, and compared them to see that they agreed. These I numbered 1, 2, 3, and 4, and thus placed them:—No. 1 outside a window, facing the north, so placed that the direct rays of the sun never fell on it. No. 2 was suspended freely in a verandah, the rays of the sun never falling on it, and subject to a free current of air. No. 3 was placed against a north wall, not part of the house, with high shrubs on the east and west, completely screening the wall from the sun at all times. No. 4 was suspended freely in the dense shade of trees.

The average of a great many observations taken at noon was—No. 1, 68°; No. 2, 69°; No. 3, 64°; No. 4, 61°. Thus it appears that the shade of the trees was cooler by from 3 to 8 degrees than the other three indicated.

I account for the difference thus:—The thermometer No. 1, placed outside a north window, though not exposed to the *direct* rays of the sun, was affected by heat reflected from an opposite wall, though at some distance. No. 2, though hanging freely in the shade of a verandah, was yet affected, in consequence of the sun shining in the morning on a slate roof, which continued to give out its heat during the rest of the day. In the case of No. 3, though the sun never shone on that part of the wall where the thermometer was hung, yet it did on other parts of the same wall, and heat was thus transmitted.

I conclude, therefore, that the true heat of the atmosphere in the shade is only to be obtained in the complete shade of trees, where the sun never penetrates, and where the air circulates freely.

Again, as to the heat in the sun. What does it mean? I suppose in general it means the heat indicated by a thermometer hanging against the south wall of a house. But this surely is deceptive, as the instrument so placed indicates not only the heat of the direct rays of the sun, but also the accumulated heat of the wall.

To determine this, I placed a thermometer against the south wall of my house, and another about 30 yards in front of this, hung to a rail, but fastened so as to face the sun in the same way as the former. The result was that the thermometer against the house stood from 4° to 25° higher than that on the rail, as the day was more or less constantly bright; but the difference always increased as the day advanced, for the reason already mentioned.

If we wish, therefore, to have any comparative returns of the heat in the shade and in the sun, we should come to some agreement as to the method we adopt to procure the information we communicate.—Yours very faithfully,

August 22nd, 1867. W. E. H.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

XXI.] OCTOBER, 1867. [PRICE FOURPENCE. orde. per ann. post free

METEOROLOGY AT DUNDEE.

THE number of meteorologists and the papers on meteorology at the Dundee meeting of the British Association were quite up to the average. We believe the only foreign meteorologist was Professor Chas. Martens, of Montpellier, for we cannot class the able observer at the Mauritius, Mr. C. Meldrum, as a foreigner. Among our own countrymen may be noted C. Brooke, F.R.S., Sec. Met. Soc.; W. R. Birt, F.R.A.S.; A. Buchan, Sec. Scot. Met. Soc.; Dr. Davy, F.R.S.; Dr. Everett; J. Glaisher, F.R.S., Pres. Met. Soc.; Prof. A. Herschel; D. Milne Home, Pres. Council Scot. Met. Soc.; Col. Sir H. James, F.R.S.; E. J. Lowe, F.R.S.; Dr. Moffat, F.R.A.S.; Prof. Phillips, F.R.S.; Col. Sykes, M.P., F.R.S.; D. Smith, F.R.A.S.; Dr. Balfour Stewart, F.R.S.; G. J. Symons, F.M.S.; E. Vivian.

We cannot find space to give all the Meteorological papers *in extenso*, much less the reports; we therefore propose to give simply condensed notices of the papers and discussions, and in these we shall, to a certain extent, avail ourselves of the reports of the *Dundee Advertiser*, the accuracy of which were the theme of general comment.

BEHAVIOUR OF THE ANEROID BAROMETER.

Dr. BALFOUR STEWART, Superintendent of Kew Observatory, read an interesting paper on the Behaviour of the Aneroid Barometer at different pressures. Experiments had lately been made with the view of ascertaining to what extent an Aneroid may be considered a reliable instrument when exposed to such considerable changes of pressure as occur in mountain districts. By means of an air pump, the Aneroids, when placed in a receiver, might be subjected to any pressure. A method of tapping the Aneroids had also been devised, and by this means the experiments as to the deviation of the results given by these instruments were conducted with comparative ease, and with the greatest accuracy. The experiments were still going on.

Sir W. THOMSON said the Aneroid had become so popular an instrument that many had satisfaction in learning that it was capable of giving results with scientific precision. Dr. Stewart had shown that in taking a barometer up a mountain of 12,000 feet, the error would only be about 300 feet, and had also shown how to correct this error. By carefully using these instruments, therefore, they had a probability of determining, with much less error, the height of a mountain of 12,000 feet.

Mr. BROOKE entered into some explanations regarding the action of the small Aneroid, one of which he had carried in his pocket for a considerable time.

Mr. GLAISHER corroborated the remarks of Dr. Stewart.

MAGNETIC DISTURBANCES.

A paper on the results of a comparison of the magnetic curves at the Observatories at Kew and Lisbon during the Disturbance of February 20—25, 1866, by Senor Capello, was also read by Dr. Stewart.

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METEOROLOGICAL OBSERVATIONS AT SEA.

Dr. MOFFAT read a paper on some observations made at sea with regard to the ozoniferous currents of the ocean. The observations referred to had been made by W. F. Moffat, R.N., between lat. 53 deg. N., and 39 S., and long. 83 E., and 25 W. Mr. Moffat had observed that, as the wind veered with increasing readings of the barometer from south points of the compass through W. to N., ozone disappeared, and continued absent while the wind was in points between N. and E., and that it reappeared as the wind veered with decreasing readings of the barometer to S. points. The disappearance and reappearance of ozone with those conditions were so regular, that the changes appeared to be the result of an invariable atmospheric law, and Mr. Moffat was induced to examine the law of rotation of the wind, so clearly developed by Dore, and the results of the examination led him to believe that the Polar current is the non-ozoniferous or that of minimum of ozone, and that the equatorial is the ozoniferous, or that of the maximum of ozone. According to the rotation theory, the N. Polar current forms the N.E. "Trade," and the S. Polar the S.E. Trade, while the equatorials form in the Northern and Southern Hemispheres the upper or returning "Trades." These returning Trades come to the earth's surface in the Northern and Southern Hemispheres about the 58 deg. or 30 degrees of latitude—the latitude varies with the season—N. and S. of the Equator.

LUMINOSITY OF PHOSPHORUS.

Dr. MOFFAT then read an account of several interesting experiments which he had made on the luminosity of phosphorus. From these experiments it was shown that phosphorus in a luminous state produced phosphorus and phosphoric acids, and ozone also; that it was non-luminous at temperatures below 39° (F), and that it was luminous above 45° (F), but the temperature of luminosity and non-luminosity varied with the pressure of the atmosphere, and also with the direction of the wind. A series of experiments, extending over four years, had been made on the luminosity of phosphorus in connection with atmospheric conditions, and from the results it would appear that the equatorial or sea wind is that of phosphorescence and ozone, and that the polar or land wind is that of non-luminosity and no ozone. As the ocean is the reservoir of ozone, Dr. Moffat asks if it is not probable that its phosphorescence is the chief source of its development—a probability strengthened by the fact that the polar and land winds seem to modify its development, as the land current does. From observations made at sea, between lat. 53 N. and 39 S., Dr. Moffat was led to believe that, were it not for the modifying influence of the polar or trade winds, ozone at sea would be a constant quantity.

Sir W. THOMSON commented on the wonderful character of the results referred to by Dr. Moffat. They were altogether new to him, and certainly he should take the very earliest opportunity of endeavouring to obtain them for himself. He remarked that the phenomenon of luminosity stored up in the ice and produced after the melting of the ice was certainly one of the most startling ever met with in physical science—the luminosity having been induced by the previous presence of non-luminous phosphorus at a low temperature. It was a most beautiful and wonderful result. He was sure the publication of Dr. Moffat's paper would induce persons in all parts of the world to repeat the experiments.

REPORT OF THE RAINFALL COMMITTEE.

After some remarks from the Chairman of the Committee, Mr. GLAISHER, who commented on the importance of knowledge regarding rainfall in connection with the water supply of large towns, Mr. G. J. SYMONS, read the report, which dealt principally with the following branches of rainfall investigations:—1. Extraction and classification of published records, being a collection into one uniform set of tables of all reliable rainfall measurements. 2. Examination of the rain gauges actually in use, by the personal visit of Mr. Symons to each observer, and the careful measurement of each gauge. Upwards of 60 were tested during the past year, and the total now visited is nearly 250. 3. Inclined and tipping-funnelled gauges. These experimental instruments were reported to be acting satisfactorily, and it was stated that Professor Phillips was about to

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undertake the reduction of the observations. 4. Experiments on the influence of river mists on the amount of rain collected were reported upon, and it was intimated that any person possessing a lake or large pond in the middle of a large level plain, and clear of trees, might very usefully employ himself in making observations. 5. Reference was made to the establishment of additional gauges in Derbyshire, and in the Lake district of England—the results whereof will be given next year. 6. A preliminary notice was given of some results, as to the relative fall of rain in the various months; and it was pointed out that the monthly per centage is very different at stations having a small fall from what it is at wetter ones—the former having the greatest per centage in the summer, and the latter in the winter. 7. The last subject noticed was the means adopted to determine the altitude of the rain gauges above the sea, explanation being given of the means of obtaining the information from the publications of the Ordnance Survey, and also of some recent arrangements carried out by Mr. Symons for obtaining approximate determinations by means of barometric observations.

Mr. GLAISHER remarked that if there were gentlemen in localities situated near large towns, and where there is a good opportunity for measuring rainfall, who had not yet taken observations, they would, by commencing to do so, and communicating the results to the Committee, aid and assist them in the very important work in which they were engaged.

STORM WARNINGS—THEIR IMPORTANCE & PRACTICABILITY.

Colonel SYKES, M.P., then read a very lengthy paper, giving in minute detail a review of the progress of Meteorological Science. He referred to the appointment of Admiral FitzRoy as head of the Meteorological Department of the Board of Trade, and to the long and most valuable and assiduous labours of that gentleman in advancing meteorology, and in applying it to the most practical and useful purposes. The storm signals made by Admiral FitzRoy were very numerous. In the course of three years he gave 405 storm warnings, and of this number 305 were correct, showing that the meteorological observations leading to these warnings were of great utility, for they might safely infer that these 305 correct predictions of storms had saved many a vessel from shipwreck, and many a human life. (Applause.) Again, as to the observations on the wind in the same period, the predictions made were correct to the extent of 38 per cent., and these results were surely sufficient justification of the continuance of the storm warnings. Upon the death of Admiral FitzRoy, however, a Committee of the Royal Society was requested to carry on the work, but this they declined to do, on the ground that Admiral FitzRoy had promulgated these signals on empirical data. This was a determination which was much regretted, not only by scientific men, but by the Mercantile Marine, and by all the fishermen on our coasts. The storm warnings originated in a recommendation by the Mathematical Section of the British Association, which met at Aberdeen in 1859, and when, in conformity with the application of the Association to the Board of Trade, telegraphic meteorology was commenced, and Admiral FitzRoy was appointed to carry it out, that appointment gave great satisfaction to the country; but now all was to be changed. The Committee of the Royal Society had refused to continue these signals, and a long correspondence had taken place on the subject; but the result as yet had only been, that while the Committee of the Royal Society still persevered in their refusal to continue these warnings, they agreed to take steps for procuring certain observations, extending over the next fifteen years, and when these were obtained they would then issue these warnings, if the nature of these observations warranted that course. In order to do this, however, a large number of new Observatories were to be established with self-recording instruments, and this at a very much larger cost to the country than the Meteorological Department of the Board of Trade had cost. He had no hesitation in saying that the argument employed in the refusal of the Committee of the Royal Society was a pedantic affectation of science—literally the coxcombry of science. (Laughter.) What was the position of other countries in regard to this matter? In France meteorological observations were made, and, in the last report on the state of the French Empire, it was stated that the storm warnings given by the Imperial Observatory at Paris were very highly appreciated. In St. Petersburg, the same thing was done, and also

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in many continental nations; and yet here were we, the most maritime nation in the world—having set the example to other countries in this matter of storm-warnings—and yet we were now dropping them. (Applause.) We were too scientific for the work. (Laughter.) Colonel Sykes then went on to show, from the memorials that had been sent to the Board of Trade from all parts of the country, that there was a great desire for the restoration of the signals—quoting from those sent by the Edinburgh Chamber of Commerce, from the Dundee Local Marine Board and Harbour Trustees, and many others—and concluded by shewing the practicability of making these observations, if not with absolute accuracy, at least sufficiently so to be of very great practical benefit to the shipping interests of the country. It was compromising the character and affecting the safety of the life and property of the country to discontinue the signals, and he thought he had shown that the restoration of the storm signals was a most urgent necessity. (Applause.) They should not submit to be deprived of the advantage given by these storm signals by the mere crotchet of individuals. (Applause.)

Mr. J. P. GASSIOT, one of the members of the Scientific Committee of the Royal Society, in reply to what Colonel Sykes had said, remarked that there was no doubt Admiral FitzRoy was an able officer, but his own general knowledge as a seaman led him to conclusions without laying down any particular system, and while he had to a certain extent been successful, he had also to some extent been unsuccessful. It would be supposed from what Colonel Sykes had said that the idea of continuing storm warnings was to be suspended for fifteen years; but the very fact of the Committee having engaged Captain Toynbee showed their desire to carry out these storm warnings in a proper and useful manner. They proposed to have observatories in certain ports, with self-recording instruments—no meteorological observations being worthy of recording, unless the instruments were self-recording. These observatories were in course of being established. They proposed to communicate to certain ports which had the sanction of the Board of Trade, all the facts which they got from the different stations, and that at these particular ports storm signals should be hoisted, and every sailor be able to get the precise information, from which he should make his own deductions to protect his own vessel.

Mr. JOHN DON, President of the Dundee Chamber of Commerce, on behalf of the commercial, manufacturing, and shipping interests of Dundee, thanked the honourable member for Aberdeen for the admirable manner in which he had brought this subject before the British Association. This question had for a considerable number of years constantly occupied the attention of the Chamber of Commerce, the Harbour Trustees, and other public bodies in Dundee. After the discontinuance of the storm warnings, they memorialised the Board of Trade and petitioned the House of Commons in April last, and the Section would therefore see that for some time past they had been urging the resumption of these storm warnings. The honourable member for Aberdeen informed them that these warnings had been discontinued in deference to the pedantic affectation of science. What might be the exact meaning of that term he could not say. All he could say was, that if these warnings had been discontinued in deference to the pedantic affectation of science, the British public would not think that a sufficient reason. (Applause.) If he was told that these warnings had been discontinued on the ground of economy, all he had to say was, that the trifling cost could not for a moment be put in comparison with the saving of valuable life and property. It occurred to him that this was a favourable time for the British Association to urge Her Majesty's Government to resume these signals. All who heard the inaugural address of the noble President—whom he was glad to see present at this discussion—must have been struck with his special and pointed allusion to the benefit of these storm signals; and his Grace's party being now in power, and knowing his immense influence with the Government, he (Mr. Don) thought that the Association ought to take the opportunity of urging the necessity of at once resuming these storm signals at all the principal ports of the United Kingdom. (Applause.) While, therefore, they were greatly indebted to Colonel Sykes for his valuable paper, he hoped that some practical effect would be given to his suggestions, and that some influential members at this meeting would draw up a formal resolution on the subject.

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Mr. D. MILNE HOME, of Wedderburn, President of the Meteorological Society of Scotland, quoted the published opinions of various authorities with regard to the notification of storms, and pointed out that, following the example set by the Board of Trade, almost all other civilized countries had adopted these storm warnings as a system which had commended itself to them, after due consideration, as profitable and useful. It appeared to him that, for our country to drop these storm signals, after suggesting them to other countries, was a most disadvantageous position for our country to be placed in, especially as Great Britain, occupying the geographical outpost to Europe, should give the most valuable information. He thought some misapprehension existed with reference to the position taken up by the Royal Society, and he wished to exonerate that Society from a small portion of the blame which had been thrown upon them. Whilst that Society would not themselves undertake the duties, because they considered them incompatible with pure science, they recommended the Board of Trade themselves to appoint an officer as successor to Admiral FitzRoy, and pointed out the proper person for the position; but the Treasury said that, unless a strong case were made out, they were not disposed, with the information before them, to sanction any expense on that account. He thought that a strong case had been made out by Col. Sykes, and as the British Association on a former occasion had been successful with the Government in inducing them to commence these storm signals, he felt sure that the British Association would be equally successful on the present occasion, if they consented to go forward and ask that these storm signals should be resumed. (Applause.) He concluded by proposing the following motion for the adoption of the Section,—"Resolved, that this Section apply to the Council of the British Association, to make a communication to Her Majesty's Board of Trade, urging them to institute arrangements for causing the storm-signals of the late Admiral FitzRoy to be resumed." (Applause.)

The DUKE OF BUCCLEUCH said he was quite ready to second that motion, and the more so in that he was one of the deputation that waited upon the President of the Board of Trade, urging this very subject upon him. (Applause.) He did not pretend to enter into the scientific aspects of the question, neither would he enter into the subject of whether the Royal Society was the proper body from which these storm warnings should emanate. What he went upon was the practical benefit that would ensue from some such signals being again resumed. As he remarked the other night, and as he had observed on other occasions, they did not ask the Board of Trade, or any body of men, to undertake the duty of being weather prophets. (Laughter.) All they wanted was to procure information for the public which would enable maritime men and others to judge as to the nature of the weather they were likely to encounter when they left port. He therefore cordially agreed with the resolution that had been proposed, and had great pleasure in seconding it. (Applause.)

Sir JOHN OGILVY remarked that he had listened with much attention to the interesting discussion which had taken place, and it had only confirmed the opinion formerly entertained by him of the value and importance of these storm signals to a large portion of his constituents in Dundee, and he should have the greatest pleasure in co-operating with His Grace in urging this matter upon the attention of the Government. (Applause.)

DR. BALFOUR STEWART said that the Meteorological Committee of the Royal Society had stated that they would have telegraphic stations scattered all over the country, and principally in the west and south-west of Ireland. They would have a telegraphic officer of great intelligence stationed at Valentia, who would be prepared to keep an outlook on the state of the weather, and whenever he found that there was a probability of a storm he would telegraph at once to the Central Office in London; and if he found the meteorological disturbance increasing, and as soon as the Central Office found that a storm was approaching, and that an actual fact had taken place, they would be ready to telegraph this fact to the out-ports without loss of time. So far as he could see, this procedure would not be very different from that of the late Admiral FitzRoy.

Mr. GLAISHER, who rose as President of the Meteorological Society, and Meteorological Director of the Greenwich Observatory, said that the Council of the Meteorological Society were very much surprised by the decision of the Royal Society

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Committee regarding the discontinuance of the storm signals. Admiral FitzRoy had trained Mr. Babington in the work in which he himself had been engaged, and the storm signals did not cease when the Admiral died, and there was no good reason why these observations should not be resumed. (Applause.) As to the self-recording instruments which it was proposed by the Committee of the Royal Society to establish, and as to what Dr. Balfour Stewart had said, that the mere fact that there was a storm in a certain quarter should be sent down to the different outports, he would say that self-recording instruments, without eye observations to check and, if need be, correct them, were of no use; and as to sending down the mere results of the meteorological observations to the coasts, he would say, for God's sake, do not do it. They would be read in a dozen different ways, and would only lead to mischief. He concluded by earnestly stating his opinion that the signals should be restored. (Applause.)

ADMIRAL BELCHER said that Admiral FitzRoy had been tried by a civil court-martial, and by a set of men who were not qualified to judge him. They should hear the naval side of the question, for it was really after all a naval question. It had been said that we could not foretell events of the weather, but he could tell them facts to the contrary. (Applause.) As far back as 1812 he recollected that it was the constant habit of the Admiral on the Bordeaux station to give signals every hour when the barometer changed, and the ships struck masts and sent down yards accordingly. On one occasion, when they were chasing the enemy, and just as they were on the point of coming up with them, their captain looked at the barometer, and suddenly gave the order to reef topsails, but before that could be done many spars were lost. On another occasion, he himself had predicted a storm in a certain quarter, and his prediction was fulfilled to the very hour. He knew they could continue the storm signals if those in authority would only be stirred up to do their duty. It was all nonsense to say they could not do so. (Applause.) Why, the cattle, the birds, the fish, and the reptiles, and in fact everything gave indications of coming storms, and, with the assistance of meteorological observations, scientific men should be able to give very precise notice of atmospheric changes. (Applause.)

COL. SYKES regretted that Dr. Balfour Stewart seemed to misapprehend him in a point of some importance. He did not mean to say that the Committee of the Royal Society were pedants, but that the arguments against the data on which Admiral FitzRoy's warnings were based, was a pedantic argument, and of no practical value.

The REV. C. PRITCHARD remarked that the impression on his mind was that, as usual, the truth in this matter lay between the two extremes. Perhaps too much had been attempted to be done by the late Admiral FitzRoy, but on the other hand he thought that the Committee of the Royal Society, with such a man as General Sabine at their head, might be trusted to do all that could be done in the matter. He thought that a slight alteration in the wording of the resolution might have a good effect. He would propose that, instead of saying that the signals of the late Admiral FitzRoy should be continued, that arrangements should be made for continuing the system of storm signals, and this would prevent them from tying the hands of Government as to the mode in which these should be made. (Applause.)

Mr. D. MILNE HOME contended that the value of the signals given by Admiral FitzRoy consisted chiefly in their specific character and intelligibility. He did not merely intimate a meteorological fact, leaving anybody to interpret it, but what he signalled was something like this—"Look out at Dundee for a gale from the S.W." It would be of no use whatever to the people of Dundee or any other port to know that a gale was blowing at Copenhagen, Valentia, or elsewhere, unless they were also told that they might expect to be visited by the same storm. (Applause.)

The DUKE of BUCCLEUCH thought, with all deference to Mr. Milne Home, that to insert the words originally proposed would perhaps lead persons to suppose that Admiral FitzRoy's system should be continued. He, however, was not quite sure but that great improvements might be made upon that system. He would be glad to see what had been begun by Admiral FitzRoy taken up and if possible improved, but he should not like to feel himself tied in any way to say that

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Admiral FitzRoy's system should be resumed. Perhaps Mr. Milne Home would allow the resolution to stand in this way, "that arrangements regarding storm signals be continued." (Applause.)

Mr. MILNE HOME was understood to consent to this proposal, and on the amended resolution being put to the meeting by Professor Kelland, it was carried unanimously.

OBSERVATIONS OF ATMOSPHERIC ELECTRICITY.

Dr. EVERETT, formerly Professor of Natural Philosophy in the University of Windsor, Nova Scotia, and now official assistant to the Professor of Mathematics in the University of Glasgow, read a paper on the "Results of Observations of Atmospheric Electricity at Kew Observatory, and at Windsor, Nova Scotia." The Kew observations included in this paper extended from June, 1862, to May, 1864, inclusive, and were taken with Sir Wm. Thomson's self-recording apparatus, specimens of the photographic curves thus taken being exhibited at the meeting. The Windsor observations, taken by Dr. Everett with apparatus of a different kind, also invented by Sir. Wm. Thomson, but not self-recording, extended from October, 1862, to August, 1864. Monthly averages which had been taken showed that at Kew there had in every month been two maxima in the day—one of them between eight and ten a.m., and the other, which was more considerable, between eight and ten p.m. At Windsor, on the contrary, the electricity between eight and ten p.m. had in every month been weaker than either between eight and ten a.m. or between two and three p.m. The annual curve for Kew had its principal maximum in November, and another in February or March. At Windsor the principal maximum was in February or March, and the minima in June and November. The annual curves for the two places agreed pretty well from January to October, but were curved in opposite directions from October to January.

ACTION OF LIGHTNING IN FORFARSHIRE.

Professor KELLAND read the following paper of Sir David Brewster's: "In the summer of 1827 a hay stack in the parish of Dun, in Forfar, was struck by lightning. The stack was on fire, but before much of the hay was consumed the fire was extinguished by the farm servants. Upon examining the hay-stack, a circular passage was observed in the middle of it, as if it had been cut out with a sharp instrument. This circular passage extended to the bottom of the stack, and terminated in a hole in the ground. Captain Thomson, of Montrose, who had a farm in the neighbourhood, examined the stack, and found in the hole in the hay-stack, a substance which he described as resembling lava. A portion of this substance was sent by Captain Thomson to my brother, Dr. Brewster of Craig, who forwarded it to me with the preceding statement. The substance found was a mass of silex obviously formed by the fusion of the silex in the hay. It had a highly greenish tinge, and contained burnt portions of the hay. I presented the specimen to the museum of St. Andrews."

(To be continued.)

TEMPERATURE IN THE SHADE AND IN THE SUN.

To the Editor of the Meteorological Magazine.

SIR,—Perhaps if no abler correspondent answers W.E.H.'s letter, you will allow me a few lines.

In the first place, the temperature of the air in the shade is *not* what meteorologists want to know; they want to know the temperature of the air. It is only through necessity that we are obliged to place our instruments in the shade. The air receives increase of heat mainly in two ways:—(1) by absorbing the direct rays of the sun, (2) by contact with the ground still more heated by them. It loses heat (1) by radiating heat into space, (2) by contact with the ground still more cooled by the same process. Now meteorologists place their instruments where these forces act, and not where they do not act; they register the highest temperature to which the air at a certain height (commonly 4 feet) above the ground is heated, and the lowest to which it is cooled by the above causes.

If it were possible to make a thermometer transparent to the sun's heat-rays, such an instrument suspended freely in the air in an open space would show the real temperature of the air. But as this is impossible, meteorologists almost without exception, I believe, place the thermometers as far as possible in an open

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space free from trees, and distant from walls upon a stand so arranged that the air has a free passage past and around the bulbs of the instruments, while the sun's rays are completely kept off. If so placed, there will be no substance that can reflect heat to them and no heated surface near, except the ground and the top of the stand, and the air which passes over the latter does not go near the instruments. Mr. Glaisher very properly insists that they shall not be hung against a board unless the bulbs project beneath, for if so placed they are affected by the temperature of the board which is slower than they to receive heat from the air.

Now in the shade, in which W.E.H. puts his thermometers, none of these causes act, and the air would hardly alter in temperature if it were not for the wind. But on calm days the circulation of the air is far from complete, and therefore, the air is cooler in such places by day and warmer by night than in an open space. Moreover, walls and trees do not readily change their temperature if not exposed to the sun, but tend further to cool by day and heat by night the air surrounding them. Trees especially are kept at a very uniform temperature by their vitality, and still further cool the air a ound by the evaporation from their leaves, so that the air in a wood, as everyone knows, is damp and cold by day, but close—*i.e.*, damp and warm—by night.

It follows, then, that without believing every "extraordinary account in the papers," we must decline to put our thermometers in a thick shade where they will register (as I have found by experiment) from 6° to 12° too low in summer heat, and as much too high in hard frosts.

About the mode of determining the heat of the sun's rays, there is, I am sorry to say, less agreement; W.E.H.'s criticisms upon the popular notions are very just, and the results of his experiments doubtless correct; still there is much more agreement that he supposes. A thermometer with blackened bulb enclosed in a glass cylinder enlarged at one end and exhausted of air—commonly called the "black bulb in vacuo"—is pretty generally employed, but it is not always similarly placed. I think the Greenwich plan of placing it upon a level piece of short grass, the simplest and the best; once raise it above the ground and there are an infinite number of different heights at which to place it, each giving a different result. Even a few inches elevation lowers the temperature 5° or 6° in summer, or even more on a bright but windy day. There could surely be no difficulty in all agreeing to adopt the very simple plan of putting it on the grass. Care, however, should be taken to select one in which the bulb is completely covered with lamp-black up to the point at which the tube first begins to widen towards the bulb, and which has also a shield of clear glass without flaws, bubbles, or inequalities, at least on the side exposed to the sun. I have found by experience, that if these points are not attended to, the instrument may read as much as 5° or 8° too low, but if they are, I believe the results are strictly comparable.—I am, Sir, yours truly,

September 19*th*, 1867. F. W. S.

To the Editor of the Meteorological Magazine.

SIR,—Your correspondent "W. E. H." has come to the conclusion, from his experiments, that the true heat of the atmosphere in the shade is only to be obtained in the complete shade of trees. But I would ask whether such a conclusion can be looked upon as correct, when we call to mind the very great evaporation that takes place from the leaves, and the vast amount of caloric that will so be absorbed, reducing the temperature. I have been lately astonished at the effect produced upon a thermometer by allowing a major convolvulus to clamber over a part of the instrument, in reducing the extent of the daily range. I quite agree in the absurdity of giving temperatures from thermometers suspended just outside windows, as any criterion of the shade temperature of any spot, and was quite startled at the wide discrepancy between my own records and those sent to the *Times*, to surprise the public. Doubtless soil has much influence, and such influences are highly interesting to trace, but we certainly ought to try to get rid of the disturbing effect of reflecting surfaces, and of walls and roofs heated, at some period of the day, by the sun's rays.—Yours very faithfully,

T. L. L.

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YELLOW HAZE AND S.E. WIND.

To the Editor of the Meteorological Magazine.

SIR,—There are two subjects which I would lay before your readers for discussion. The first is, the peculiar yellow haze which accompanies an east wind at all seasons of the year, but especially in spring, and which country folk call London smoke, but which I have noticed in Wales and in Germany. The second is the frequency of S.E. winds in this country, in the middle of the months of March and October, especially in October. The S.E. wind being, according to the present theory, a S.W. wind, deflected in its lower portions by a N.E. current, should be colder than the S.W., and so it often is, and we have a pretty positive proof of the truth of this theory, since we often observe with this wind the high clouds moving from the S.W., the low drift from the S., while a thin stream beneath flows languidly from the S.E., and further by the abundant rain (the most copious of all our rains) that falls under these circumstances.

But sometimes this wind is wonderfully warm, not so much from the sun's rays shining without screen, as because the air itself is highly heated, as evidenced by the night and shade temperatures. In Bavaria, men of science hold that the air from the deserts of Africa traverses, sometimes, the Alps, producing the violent breaks which occasionally occur in their somewhat severe winter there. May we not also be justified in assuming that the class of S.E. winds under discussion, come to us from the deserts of Africa giving a mitigated siricco? When they blow, the air is singularly transparent, and the only clouds are largish quantities of cirrus with little motion. This is the class of S.E. winds that we have in October, and I would further suggest that such a bed of heated air from Africa, wandered over Europe at the beginning of May in this year.

I think the S.E. is the most curious and interesting wind that blows in this country, not only because of its somewhat obscure origin, but also because, with it, we have the least atmospheric pressure, which fact has never been satisfactorily explained. I wish we had records, with their heavy rainfalls, in the United States, of the direction of their winds. I am reminded of this by observing that you quote one of these records.—Yours faithfully, T. L. L.

LUNAR RAINBOW.

To the Editor of the Meteorological Magazine.

SIR,—At 7.30 p.m. September 10th, a beautiful lunar rainbow appeared here in the N.W. quarter, and continued visible for about seven minutes. We had no positive cloud overhead, but a very light vapour, with a scarcely perceptible drizzle for a minute or two. The gibbous moon was rather wan among some moving vapours. The arc itself was about 30° high, and shown upon grey cumulus, below which at the horizon was a long stripe of silver light.

This is the third lunar rainbow I have seen, and it differs from the other two, in possessing colour. The others were merely faint, pale arcs, but in this a fusion of rich colours, as in a fading solar bow, was seen. Moreover, a marginal repetition, just within the main broad stripe, could be descried by careful eyes. The arc was about half the apparent width of a near solar bow. The southernmost spring of the arch was at first the brightest part; then the crown, and then the northern column; and so it died away.

I hope other correspondents will tell you how far it was seen, and what it was like.—Yours very obediently, R. D. BLACKMORE.

BOOKS, &c., RECEIVED.

FOURNET, M. J., "Commission Hydrométrique et des Orages de Lyon," 1866, 23e Année.

HARRISON, J. P., M.A., "On Radiation and Vapour." [*Phil. Mag.* April, 1867.

" " " "On the Relation of Insolation to Atmospheric Humidity." [*Proc. Roy. Soc.* No. 90, 1867.]

HOSKINS, S. E., M.D., F.R.S., "A tabular form of analysis to aid in tracing the possible influence of past and present upon future states of weather." [*Proc. Roy. Soc.*, No. 93, 1867.]

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SEPTEMBER, 1867.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Date.	Days on which .01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of nights below 32°.
			inches	inches.	in.							
I.	ENGLAND.	Camden Town	2·23	— ·03	·55	11	11	79·0	1	36·0	25	0
II.		Staplehurst (Linton Park)	1·43	— ·79	·56	10	12	79·0	2	32·0	25	0
,,		Selborne (The Wakes)	2·65	+ ·21	·90	9	12	75·0	3	31·6	25	1
III.		Hitchen	1·86	0·00	·72	10	10	74·0	1	35·0	24	0
,,		Banbury	1·79	— ·58	·69	2	13	74·3	1	33·5	26	0
,,		Wisbech	2·26	...	1·00	3	6?	77·2	1	35·1	25	0
IV.		Bury St. Edmunds (Culford)	2·63	+ 1·02	·92	9	9	80·0	1	33·0	24	0
V.		Calne	...	...	...	...	...	...	...	...	...	...
,,		Plymouth (Goodamoor)	2·88	— 1·77	...	...	...	...	...	...	...	...
,,		Barnstaple	2·09	— 1·68	·32	15	16	..	...	...	...	..
,,		Taunton (Fulland's School)	1·31	— ·35	·64	2	8	87·0?	2	38·0	24	0
VI.		Shrewsbury (Highfield)	1·52	— ·68	·39	13	14	...	...	...	...	...
,,		Tenbury (Orleton)	1·79	— ·90	·39	3	13	74·8	2	35·0	26	0
VII.		Leicester (Wigston)	1·94	— ·27	·93	3	6	81·0	2	34·0	24*	0
,,		West Retford	...	...	..	...	..	...	...	...	...	...
,,		Derby	2·86	+ ·52	1·39	3	15	75·0	2	38·0	26	0
VIII.		Manchester	2·99	— ·71	·62	1	19	76·6	2	38·0	17	0
IX.		York	1·75	— ·59	·41	14	10	69·5	5	42·0	25†	...
,,		Skipton (Arncliffe)	5·27	+ ·31	·84	15	19	68·0	5	43·0	17	0
X.		North Shields	1·85	+ ·15	·56	11	13	68·2	5	41·5	26	0
,,		Borrowdale (Seathwaite)	12·47	— ·74	1·73	6	21	...	...	...	...	...
XI.	WALES.	Abercarn	3·31	...	·90	7	14	75·0	1	40·0	25	0
,,		Haverfordwest	3·54	— ·17	·80	10	11	71·7	2	38·5	17	0
,,		Rhayader (Cefnfaes)	2·96	— ·88	·50	5	20	70·0	...	35·0	..	0
,,		Llanberis (R. Victoria Hotel)	6·75	...	1·18	4	12	...	...	...	...	...
XII.	SCOTLAND.	Dumfries	3·87	+ 1·14	·76	5	21	68·5	2	38·0	17	0
,,		Hawick (Silverbut Hall)	2·12	...	·44	1	15	...	...	...	...	...
XIV.		Ayr (Auchendrane House)	4·26	+ ·53	·62	28	23	74·0	4	34·0	17	0
XV.		Otter House	5·67	+ ·85	·85	5	19	67·0	2, 4	42·0	18‡	0
XVI.		Leven (Nookton)	2·20	— ·28	·59	12	14	66·0	4	38·0	17	0
,,		Stirling (Deanston)	4·72	+ 1·57	1·03	3	19	67·3	4	30·8	17	1
,,		Logierait	2·00	...	·46	6	13	...	...	...	...	..
XVII.		Ballater	1·94	...	·52	12	16	66·0	4	30·5	18	1
,,		Aberdeen	1·97	...	·76	8	19	64·8	29	41·7	18	0
XVIII		Inverness (Culloden)	1·31	...	·38	30	8	65·0	4	42·4	18	0
,,		Fort William	5·79	...	·92	28	25	...	...	...	...	...
,,		Portree	7·77	— 3·00	1·82	28	22	66·2	10	36·0	20	0
,,		Loch Broom	5·40	...	2·05	28	22	...	...	...	...	...
XIX.		Helmsdale	3·01	...	·59	12	22	...	...	...	...	...
,,		Sandwick	5·38	+ 1·72	1·60	10	21	61·8	3	41·8	24	...
XX.	IRELAND.	Cork	3·58	...	1·32	11	16	...	...	...	...	...
,,		Waterford	2·53	— ·60	·63	11	17	71·0	15	44·0	22	0
,,		Killaloe	3·14	— 1·02	·69	9	16	74·0	3	36·0	18	0
XXI.		Portarlington	1·69	— 1·59	·23	5	22	63·5	1	36·0	17	0
,,		Monkstown	1·31	— ·68	·29	2	14	70·0	3, 21	40·5	21	0
XXII.		Galway	3·52	...	·49	6	20	68·0	2, 17	43·0	30	0
,,		Bunninadden (Doo Castle)	3·07	...	·51	4	18	67·0	3	31·0	18	1
XXIII		Bawnboy (Owendoon)	4·06	...	·65	6	22	78·5	2	39·0	17	0
,,		Waringstown	1·45	...	·19	6	16	71·0	2, 3	34·0	16	0
,,		Strabane (Leckpatrick)	2·27	...	·43	4	20	74·0	3	36·0	18	0

*And 30th. †And 26th. ‡And 20th. ‖And 30th.

+ Shows that the fall was above the average; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

LINTON PARK.—Fog on 14th and 21st; T on 10th, and frost on 25th.

SELBORNE.—TS at 11 p.m. with heavy R on 2nd. Violent TS at 6 a.m. on 3rd, which struck the chimney of a lodge about a mile from here. Another TS on 9th at 9 p.m., during which ·90 in. of R fell in two hours. First frost on 25th. Harvest generally completed by the 14th. On the whole a good harvest month, and the hops generally very fine, and in large quantities in this parish.

BANBURY.—TS with heavy R at midnight on the 2nd, and again between seven and eight the following morning. Mean temp. of month slightly above the average.

WISBECH.—Fog on 2nd and 21st. Frost on grass on 25th. TS, with 1 in. of R, on the 3rd. Three sheep killed under a tree near here during this storm.

CULFORD.—T on 3rd. Latter part of the month very fine.

TAUNTON.—The R on the 13th, though only ·32 in., was noticeable from its literally coming down in sheets of water. Weather warm and genial. Harvest operations carried on uninterruptedly.

ORLETON.—A fine pleasant month, with moderate rainfall. Temp. nearly 2° above the average. Bar. high and steady. L in S. on evening of 2nd. Frequent TSS all day on 3rd, with L all night. Violent wind on 30th.

DERBY.—An unusually fine month; the mean temp. 2°·3 above the average of 21 years, but still 5°·3 below the magnificent September of 1865.

MANCHESTER.—TS on 3rd.

NORTH SHIELDS.—Solar halo on 9th.

SEATHWAITE.—Potatoes much diseased.

WALES.

ABERCARN.—TS to the S. on 1st. A heavy TS at 5 a.m. on the 3rd, with very vivid L to the N. and S.; this was repeated on the 4th, when the atmosphere was very oppressive and unusually warm; thus there were three TSS from the 1st to the 4th. Rather wet to the 15th, afterwards fine and calm.

HAVERFORDWEST.—First fortnight showery, wet, and very trying for harvest operations. Heavy TS, with vivid L, on morning of 3rd, rainfall ·45 in. in one hour. T and L again, but less violent, on 6th. After the 15th the weather became settled, fine and clear; nights relatively warmer than the days; harvest well got in. Some three or four nights at the end were cold and foggy.

CEFNFAES.—A heavy TS, or rather three TSS, during the day of the 3rd. Temp. low. Grain crops in this district generally good, and well got in. A small flight of fieldfares seen on 20th.

SCOTLAND.

DUMFRIES.—More or less R every day during the first fortnight; the second fine, with occasional showers. TS on 3rd. Harvest very protracted; all the grain cut on many farms before a sheaf was in the barn yard. After the 15th the fields rapidly cleared, the grain, owing to the brisk wind during the rainy period, being in better condition than had been expected. Harvest in the lower districts completed by the end of the month. Potatoes slightly diseased, but the crop good. Pasture fields fresh and green.

HAWICK.—L for two hours on the night of the 2nd. Aurora on the 23rd. Much wind during the last 10 days. Hurricane from the S. on 29th and 30th. Cereal crops in fine order. Potatoe disease very prevalent.

AUCHENDRANE.—September is the principal harvest month in this locality, and with the exception of January and December, it is our wettest month; and this year the weather has been worse than usual. Fortunately, there was a period of nearly dry weather between the 14th and 21st, favourable for harvest operations.

OTTER HOUSE.—Hoar frost on 17th and other days; R mixed with H on 23rd. Harvest nearly completed, under severe and almost continued equinoctial gales. The steam plough is a great boon to the West Highlands.

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NOOKTON.—Showery till the 12th, then fine to the end, except the 29th, 29th, and 30th which were stormy.

DRANSTON.—Much T, L, and R, from 3rd to 6th; after the middle of the month one week dry and fine, another cold and wet. Some grain still uncut, and much to remove from the fields; fruits generally scarce, plums unripe, and all wanting in sweetness and flavour, and rotting on the trees.

LOGIERAIT.—First half, unsettled with heavy R; T with H on 6th; latter half of month all that could be desired for harvest work; succession of N.W. gales from the 23rd.

BALLATER.—Lunar rainbow on 12th, eclipse on 13th. Unsettled in the early part of the month, with occasional strong breezes and heavy R, latter part fine harvest weather with, however, fearful hurricanes from the northward on the 24th and 30th shaking the earlier ripened corn crops; no word of potatoe blight in this district. T on 5th.

ABERDEEN.—On the whole the month has been tolerably well suited for harvest operations, but much of the corn is still out, and much even uncut. Fog on four days. Auroræ on 11th, 13th, 20th, 22nd, 25th to 27th, and 29th.

ROSS PARSONAGE, FORT WILLIAM.—There is nothing exceptional to report. This year as last, R was registered on every day except four, but the total fall was only 5·79 against 9·43 last September, and the greatest fall was only ·92, on the 28th, whereas last year upwards of an inch was measured on four consecutive days, from the 18th to the 21st.

PORTREE, ISLE OF SKYE.—The month has been wet and stormy; but little shearing done yet; if the weather would permit, the crops are now generally ready for the sickle. T on the 12th, and L on the evening of the 30th; a heavy gale from the W., from 10 a.m. to 4 p.m. on the 29th; on the 30th, from 1 to 7 p.m., the bar. rose ·650 in.

LOCHBROOM.—The month commenced most favourably for harvest operations, but owing to the lateness of the crops very little was secured when the change of weather began, about the 12th, and since then we have scarcely had a fine day. The last few days have been remarkable for wind and R, the fall on the 28th being the greatest I have ever recorded, the rivers overflowed their banks, doing much damage to the standing crops and carrying much of that which was cut, away to the ocean.

SANDWICK.—Auroræ on 1st, 7th, 13th, 19th, 22nd, 26th, and 27th. R much above the mean; indeed, it has been the wettest September but two during the time I have observed, and one of those, 1863, was the same as this, 5·38, while 1847 was 6·04. The temp. rather below the mean, and the equinoctial gales were severe during the last nine days. On 28th a gale blowing 40 miles an hour from 3 a.m. to 5 p.m.

IRELAND.

MONKSTOWN.—Severe gales on mornings of 12th, 28th and 30th; hazy on 17th; auroræ on the 20th and 24th.

DOO CASTLE.—Wet to the middle of the month, from which to the end, with a few exceptional days, we had glorious harvest weather; equinoctial gales set in on the 27th and have continued to blow fiercely and uninterruptedly to the end. Oats cut but a few days have been stacked, owing to the brisk breeze; I regret to say that the potatoe crop in this neighbourhood will be almost a blank this year.

OWENDOON.—T S on 2nd; T on 5th, 6th, and 9th. This month has been most seasonable for the harvest, which has now been pretty well secured.

[I quite agree with the ? against my August minimum temperature. I suspected it at the time, and have since found that it arose from the wind shaking the thermometer, and so sending the index back.—G. H. L'E.]

WARINGSTOWN.—Early part of month showery and unfavorable, latter part very fine and seasonable. Potatoe disease very bad, nearly half the crop damaged. T on 6th.

LECKPATRICK.—First half of month very stormy and wet, most unfavourable for reaping and securing the corn.

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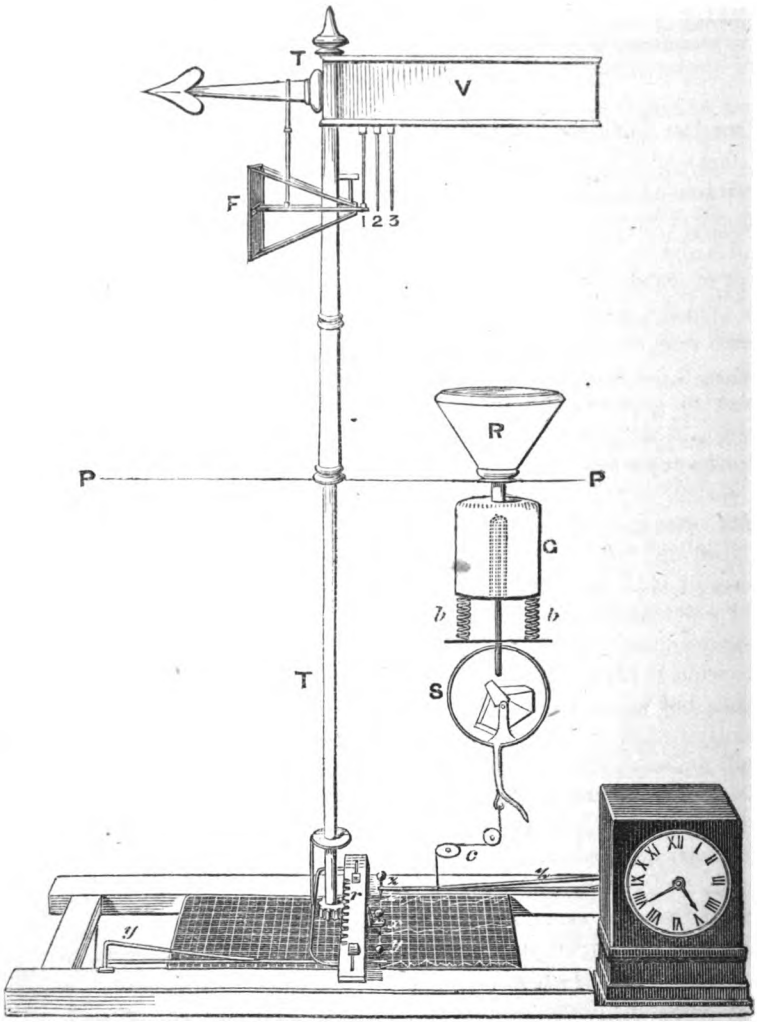
OSLER'S PRESSURE ANEMOMETER.



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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

XXII.] NOVEMBER, 1867. [PRICE FOURPENCE. or 5s. per ann. post free.

ANEMOMETERS.

(*Continued from page* 88.)

THE last instruments which we have to notice, are those in which the force of the wind is measured, instead of its velocity. Before describing them it seems expedient to draw attention to an oversight of frequent occurrence. In many meteorological works tables will be found based on experiments made by Smeaton, Hutton, and others, by means of which observers are instructed to convert records of pressure into velocity, and *vice versa*. Without presuming to quote their absence from Guyot's splendid tables, as proof that this cannot safely be done, it certainly is an indication thereof, and supports the caution against the practice which we have previously recorded.* "We desire, however, in the first place, to lodge a protest against the possibility of obtaining any *simple* rule for the conversion of velocity into pressure, and *vice versa;* because the momentum of a body varies with its density: hence, if the barometer be at, say 28 inches, the pressure of any wind will be less than if the barometer were at 30 inches, the velocity in each case being the same, since each cubic foot of air would weigh about 36 grains more then, than at 28 inches."

Moreover, the pressure plate though at a right angle to the direction of the wind in azimuth, can only be truly perpendicular to horizontal currents, but we all know full well how rarely the motion of the wind is strictly horizontal, therefore it is only rarely that the plate receives the full force to which it is entitled. There can be no doubt, however, that a pressure record is a desirable addition to any observatory, and that the results are extremely interesting. Perhaps the best proof of this is to jot down some of the places where pressure anemometers are at work, Greenwich, Lloyd's, Liverpool, Wrottesley, Wisbech, Birmingham, Osborne, occur to us immediately, also Plymouth, Edinburgh, and Inverness in former years; thus widespread has been their adoption. Until very recently the only instrument in actual use as a pressure recording anemometer, was that shown on the opposite page, and for which, by the bye, we are indebted to Messrs. Negretti and

* *Meteorological Magazine*, Vol. I., p. 19.

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Zambra, who on their own account, and as successors to Mr. Newman, have hitherto, we believe, had the manufacture almost exclusively in their hands.

Mr. Follet Osler is the inventor of a self-recording apparatus which registers the direction and pressure of the wind, and the amount and duration of rain, upon the same sheet of paper.

The mechanism may be modified in various ways, but the following is a description of the simplest arrangement.

The instrument, of which the engraving is a diagram rather than a picture, consists, first, of a vane, *V*, of a wedge-shape form, which is found to answer better than a flat vane; for the latter is always in a neutral line, and therefore is not sufficiently sensitive. At the lower end of the tube, *T T*, is a small pinion, working in a rack, *r*, which moves backwards and forwards as the wind presses the vane. To this rack a pencil, *x*, is attached, which marks the direction of the wind on a properly ruled paper, placed horizontally beneath, and so adjusted as to progress at the rate of half an inch per hour, by means of a simple contrivance connecting it with a good clock. The paper is shown in the illustration upon the table of the instrument.

The pressure plate, *F*, for ascertaining the force of the wind, is one foot square, placed immediately beneath, and at right angles with the vane; it is supported by light bars, running horizontally on friction rollers, and communicating with flattened springs, 1, 2, 3, so that the plate, when affected by the pressure of the wind, acts upon them, and they transfer such action to a copper chain passing down the interior of the direction tube, and over a pulley at the bottom. A light copper wire connects this chain with the spring lever, *y y*, carrying a pencil, which records the pressure upon the paper below. Mr. Osler much prefers a spring to any other means for ascertaining the force of the wind, because it is of the highest importance to have as little matter in motion as possible, otherwise the momentum acquired will cause the pressure plate to give very erroneous indications. The pressure plate is as light as is consistent with strength. It is kept before the wind by the vane, and is urged out by three or more springs, so that with light winds one only is compressed, and two, or more, according to the strength of the wind.

The rain gauge is placed on the right in the figure, *P P*, being the plane of the roof of the building. The rain funnel, *R*, exposes an area of about 200 square inches. The water collected in it is conveyed by a tube through the roof of the building into a glass vessel, *G*, so adjusted and graduated as to indicate a quarter of an inch of rain for every 200 square inches of surface—*i. e.*, 50 cubic inches. *G* is sup-

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ported by spiral springs, *b b*, which are compressed by the accumulating rain. A glass tube, open at both ends, is cemented into the bottom of *G*, and over it is placed a larger one closed at the top like a bell glass. The smaller tube thus forms the long leg of a syphon, and the larger tube acts as the short leg. The water, having risen to the level of the top of the inner tube, drops over into a little copper tilt, *t*, in the globe, *S*, beneath the reservoir. This tilt is divided into two equal partitions by a slip of copper, and placed upon an axis not exactly balanced, but so that one end or the other preponderates. The water then drops into the end of the tilt which happens to be uppermost, and when quite full it falls over, throwing the water into the globe, *S*, from which it flows away by the waste pipe. In this way an imperfect vacuum is produced in the globe, quite sufficient to produce a draught in the small tube of the syphon, or the long leg; and the whole contents of the reservoir, *G*, immediately run off, and the spiral springs, *b b*, elevate the reservoir to its original position. To produce this action, a quarter of an inch of rain must have fallen. The registration is easily understood. A spring lever, *z*, carrying a pencil, is attached by a cord, *c*, to *S*. This spring always keeps the cord tight, so that as the apparatus descends during the fall of rain, the spring advances the pencil more and more from the zero of the scale upon the paper beneath, until a quarter of an inch has fallen, when the pencil is drawn back to zero by the ascent of the reservoir.

The clock movement carries the registering paper forward by one of the wheels working into a rack attached to the frame.

The adjustment of the instrument should be carefully made at its first erection. The scale for pressure should be established experimentally, by applying weights of 2, 4, 6, &c., lbs., to move the pressure plate.

The registration trace for twenty-four hours is readily understood. The direction is recorded on the centre part; the pressure on one side, and the rain on the other. Lines parallel to the length of the paper show no rain, steady wind, and constant pressure. On the rain trace, a line parallel to the width of the paper shows that the pencil had been drawn back to zero, a quarter of an inch of rain having fallen. The hour lines are in the direction of the width of the paper.

At the International Exhibition 1862, Messrs. Negretti and Zambra exhibited an improved Osler's anemometer, having combined with it Robinson's cups, so that the pressure and velocity appear on the same sheet, on which a line an inch in length is recorded at every ten miles; thus the complete instrument shows continuously the direction, pressure, and velocity of the wind, and the amount of rain.

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METEOROLOGY AT DUNDEE.

(Continued from page 105.)

RAINFALL AT ARBROATH.

Mr. GLAISHER read a communication by Mr. Alexander Brown regarding Observations of the Rainfall at Arbroath. It stated that the want of a proper supply of water for the town of Arbroath had for a considerable time been felt, and along with the recent rapid increase of the town that want had also increased. In the ten years between 1850 and 1860, four reports on the subject of a water supply for Arbroath by three civil engineers had been submitted to the inhabitants by the Town Council, and in two of these reports the question of rainfall in the town and surrounding district had been introduced. In the event of this subject again coming into notice, a table was submitted which it was considered might be of service. It embraced an abstract of Mr. Brown's rain register for a period of nearly twenty-four years from the beginning of March, 1843, to the close of 1866. It contained the amount of rainfall in every month and the total rainfall in each year. It appears that the average annual fall over twenty-four years is 27·013 inches—the highest annual fall being in 1864, 34·020 in., and the lowest in 1854, 20·818 in.; the least monthly fall, March, 1856, 0·121 in., and the greatest, October, 1864, 7·804 in. The rain gauge is 60 feet above the medium sea level, and 2 feet from the ground. The same form and size of gauge has been used throughout, and its position has never been altered. The diameter of the receiving funnel is 7·5 inches. The fall in January and February, 1843, was not observed; assuming that it was equal to the average, it would give a total annual fall for 1843 of 26·984 inches, and throwing the twenty-four years, over which the observations extend, into groups of four years each, the quantities come out as follows:—

MEAN ANNUAL RAIN.

Average of 1843 to 1846—27·786	} Mean Annual Rain Average of first twelve years, 26·420.	
,, 1847 ,, 1850—26·162		
,, 1851 ,, 1854—25·311		
,, 1855 ,, 1858—25·598	} Average of second twelve years 27·603.	
,, 1859 ,, 1862—29·145		
,, 1863 ,, 1866—28·066		

A diagram was given, from which it appeared that during the period over which the observations extend, there were three years of great rainfall, namely, 1848, 1856, and 1864, having an interval of eight years between each of greatest rainfall.

Some discussion followed, in which remarks were made on the importance of the subject of rainfall as respects agriculture, commercially, as regards water-power mills, and in a sanitary point of view, as respects our great cities and towns.

LUMINOUS METEORS.

Mr. GLAISHER was called upon by Sir William Thomson for his report on Luminous Meteors. Last year there were such a vast number of observations, that the Committee had had the greatest difficulty in keeping the report within reasonable compass; at the Royal Observatory alone about 9000 meteors had been observed, and the observations of even that one shower would make a bulky catalogue; for these and other reasons it had been decided that the meteors noted at Greenwich should henceforward form part of the annual volume of Greenwich Observations, and therefore it would be unnecessary to print them in the British Association Report. One large meteor was observed at Cardiff, and the luminosity remained visible for about eighteen minutes. One was also seen above Dundee of extraordinary brilliance, which was ascertained to be about 51 to 57 miles above the earth. A curious detonating fire-ball was then described, which was seen in broad daylight in France and the South of England in June last. Another was seen at Glasgow, which passed over St. Andrews, where it appeared to consist of three parts, each equal to Venus, and it was calculated that this meteor passed at a distance of about fifty miles above the earth. At Aberdeen, a brilliant fire-ball was first seen last November, which it was afterwards found was seen also over the whole of Scotland, and as far south as Nottingham. A remarkable fire-ball, seen near Basle—of which there was a colored diagram on the wall—had been observed in the

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Observatory at Basle and also in Paris. A large amount of information was given regarding the reports received from various localities where the meteoric shower of last November was seen—the Cape of Good Hope, and other places, which, combined, cannot fail to yield most valuable accessions to our rapidly increasing knowledge of these once mysterious visitants.

Sir WM. THOMSON then said that Professor Herschel would make a few remarks on the character and quality of the meteoric light, a subject in the investigation of which he had been singularly successful.

Professor ALEXANDER HERSCHEL, Glasgow, said that the spectroscope showed a yellow band, but of what this light was composed it was impossible to say. As, however, observers multiplied, with telescopes armed with spectroscopes, this difficulty would no doubt be resolved. The connection between comets and meteors had this year been established without doubt, and that connection gave wide scope for speculation as to the origin and character of meteoric bodies. Mr. Huggins made an observation on the light of a comet, and although that observation was not perfect, still it was sufficient to identify the light of the nucleus of the comet with that of the meteoric bodies. There were two theories as to these meteors. Le Verrier had shown that their orbit extended from that of Uranus to that of the Earth, while an Italian astronomer believed that they came from the utmost fields of space. Fifty-six showers were well established, and it was by the study of these showers that they hoped to continue, and possibly confirm and extend their researches, aided also by the assistance of those zealous observers who had hitherto been their supporters and constant assistants among the members of the Association. (Applause.)

In answer to a question from Sir Wm. Thomson,

Professor HERSCHEL said it was too bold to say that every shooting star was a comet. They were more likely the dissipated parts of comets—probably comets torn into shreds by the sun's attraction.

THE METEOR SHOWERS OF AUGUST, 1867.

A paper on this subject by Mr. George Forbes, was read by Professor SWAN. On its conclusion,

Sir WM. THOMSON remarked that the paper they had just heard was from a very promising young naturalist, and it must be very gratifying indeed to the members of the British Association to have a communication from a son of Principal Forbes, who had been so long connected with the British Association.

EVAPORATION FROM RAIN GAUGES.

This paper was by Mr. THRUSTANS, of Wolverhampton, and recounted the results of experiments with six tin cylinders, in each of which a certain quantity of water was placed. Three of these had lids with apertures of different sizes, and three others had apertures of the same diameters as those of the other three vessels, and tubes of the same size, reaching nearly to the bottom. The contents of these vessels had been measured monthly, and it appeared that the total loss was never very considerable, decreasing with the aperture, and being very materially reduced by the pipes, so that with a pipe like that in a 5-inch Howard's gauge, the loss was scarcely appreciable.

METEOROLOGY OF THE MAURITIUS.

Mr. MELDRUM, Director of the Mauritius Observatory, read a paper on the meteorology of that island, in which he reviewed the diurnal and annual variations of the meteorological elements as derived from daily observations taken for a period of seven years. The results were contained in forty-two tables, accompanied by diagrams. Mr. Meldrum called special attention to the fact that at Mauritius the pressure of the dry air had a double maximum and minimum, so that Dove's explanation of the double progression of the total atmospheric pressure, which had been adopted by Sabine, Herschel, and others, did not apply at that station. He (Mr. Meldrum) was aware that a similar behaviour of the dry pressure at Bombay had been ascribed to alternate land and sea breezes, but it might be doubted whether such an explanation would account for the double progression of the total pressure at Mauritius. Another point to which he called special attention was the rainfall, illustrating by a map of the island the great influence of local circumstances on the annual fall. Of late years the island had greatly suffered from drought, which was attributed to the extensive clearings which had

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been going on; and it would be gratifying to know the opinion of the Section as to the probable effect, with respect to rainfall, of cutting down trees on an extensive scale. Mr. Meldrum next referred to the hurricanes of Mauritius, and stated that no heavy gale or hurricane occurred within 1500 miles to the north-east or south-west of the island, the existence of which was not made known by the barometer and weather. In conclusion, Mr. Meldrum stated that a new observatory was to be erected and furnished with self-recording instruments, the Governor of the colony, Sir Henry Barkly, who had already done so much for science, being a warm supporter of the measure.

THE HURRICANES OF THE INDIAN OCEAN.

Mr. MELDRUM next read a paper on the Hurricanes of the Indian Ocean, in which he dwelt on some points of great interest and importance. After showing how these hurricanes originated between the S.E. trade wind and N.W. monsoon, how the wind in them rotated from left to right, or with the hands of a watch, how they travelled at first to S.W. and then curved to S. and S.E., Mr. Meldrum alluded to their form, showing that the wind blew spirally, and illustrated the subject by interesting quotations from the log-book of the Earl of Dalhousie, a vessel which, he believed, belonged to the port of Dundee, and which in May, 1863, had scudded round and round the centre of a revolving storm three times, at the rate of 10 to 13 knots, nearing the centre each time she went round it. As the S.E. trade wind frequently blew strongly over many degrees of longitude during a huricane with a falling barometer, it was impossible to know the bearing of the centre when a vessel was in front of a storm, and at some distance from the centre, and Mr. Meldrum could adduce instances of great loss of life and property arising from vessels in those circumstances adopting the recommendation usually given of running to the westward or north-west. It could not also be made too widely known that a large portion, perhaps the largest, of the losses caused by hurricanes in those seas arose from the fact that homeward bound vessels took apparent advantage of increasing N.E. winds between 10° and 16° S., and, running to the south-west, got in front of the storm, in which they were often dismasted, if they did not founder; whereas, by lying to for a few hours, or proceeding cautiously to the southward, the storm would have been avoided. Mr. Meldrum illustrated his paper by maps and charts, showing the actual positions of the vessels and the direction of the wind, and stated that the Meteorological Society of the island had collected a large mass of facts and observations bearing on the meteorology of the Indian Ocean.

Mr. BUCHAN, Secretary to the Scottish Meteorological Society, said the point to which Mr. Meldrum had referred—that of the in-moving spiral direction of the wind—was, he believed, true. Mr. Meldrum was returning soon to the Mauritius, intending to give very special attention to the whole subject of storms in the Indian Ocean, of which they practically knew little except what they had been made aware of by the Meteorological Society in Mauritius. Referring to the map which Mr. Meldrum had exhibited, and which he presumed did not represent the direction of the wind at any specific time, he remarked that the value of such a map, which was to a great extent hypothetical, was not to be compared with actual observations; and the Association should invite Mr. Meldrum when he prosecuted the subject of storms to furnish a succession of charts, in which his actual observations were laid down, and in which they could see the real bearing of the whole question so far as actual observations, unmixed with hypotheses, would show.

Mr. MELDRUM remarked that he had brought with him a great many charts, which were open to inspection, showing the actual observations.

Mr. SYMONS spoke to the value of Mr. Meldrum's papers, and proposed that the former should be printed in extenso in the report of the Association, which was agreed to unanimously.

Sir WM. THOMSON remarked that owing to the double nature of many of the storms in the Indian Ocean, the rule of keep your nose on the wind and the wind on your left might lead to a vessel passing from one storm right into the heart of another. These double storms were of frequent occurrence in the Indian Ocean, and it was of great importance to the security of the navigation of that sea that rules should be drawn up with special reference to the doubleness of storms. In

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Mr. Meldrum's paper they had evidence of great industry and skill, and as the Mauritius was one of the most important meteorological stations, it was to be hoped not only that on his return Mr. Meldrum would continue his observations, but also that when a new meteorological observatory was established at Mauritius, there might be an electrical department in it. (Applause.)

NEW TELEGRAPHIC THERMOMETER.

PROFESSOR WHEATSTONE communicated a description of recent improvements in the telegraphic thermometer introduced by him in 1843; he did not state the result of actual trials, but the apparatus, divested of accessories, consists of a metallic thermometer in an air-tight box (*a*) which may be placed anywhere, on the top of Mont Blanc or at the bottom of the sea, provided only that two insular wires lead from it to a similar instrument (*b*) in any convenient position. On turning a handle attached to (*b*), the temperature at (*a*) is marked on the dial of (*b*).

PROPERTIES OF VAPOUR IN THE ATMOSPHERE.

PROFESSOR FOSTER then read a paper on the above, by Mr. R Russell, F.R.S.E., in which the author, after admitting the ingenuity of Professor Tyndall's researches on heat as a mode of motion, took exception to some of his deductions on the influence which the vapour of water exerts in modifying the intensity of solar and terrestrial radiation. He, on the other hand, came to the conclusion that the radiant powers of the vapour of water in the atmosphere were not even capable of forming clouds, though they might be capable of forming mists in valleys. In our atmosphere the vapour of water had little power of transmitting its heat into space when it approaches or reaches the dew point. If any cloud had been caused by the radiation of heat into space, its upper surface would be flat, like the mists in the meadows before sunrise. These and other reasons led him to the conclusion that the radiation of vapours into space has, directly a very slight influence on the production of rain.

Sir WM. THOMSON observed that the paper that had been read contained some very important arguments on a difficult question of meteorology. He did not doubt that the author was right in the main in maintaining that cold produced by expansion had a verysmall effect in causing those condensations which gave rise to torrents of rain. But he thought he had undervalued very considerably the influence of radiation in producing that minor condensation by which mists and clouds were constituted. He said minor condensation—meaning condensation from a gaseous condition into small spherical globules, so small that the resistance they met with kept them suspended. The reason why a cloud did not fall down as rain was that every part of the cloud was composed of very minute drops of water. The larger the drops were that constituted a cloud the more rapidly would they fall; but when very small they fell insensibly, as Professor Stokes had shown, only perhaps a few inches in an hour. When somewhat larger, they formed what we called a Scotch mist, which was something between a shower of globules coming down appreciably and a shower of globules in which the descent was insensible; and it appeared to him that Mr. Russell had undervalued the influence of the radiation referred to. He would not pronounce, however, at present upon the vexed question of the radiating power of transparent gaseous vapour. Professor Magnus, of Berlin, and Dr. Tyndall had been investigating that subject; and although up to this time they had not been able to agree on their conclusions, he had no doubt that two such eminent observers would yet arrive at a conclusion, and give the benefit of it to the world. (Applause.) But as to the influence of radiation and the influence of minor condensation to which he had already alluded, as soon as a cloud exists, whether high or low, each particle becomes a radiator. It radiates heat and becomes itself a little cooler than the surrounding air, and so becomes a reservoir of condensation. That takes place at the top of the cloud if there is clear air above it, and so with the mist in the valleys. The observations of Wells, the discoverer of the true theory of dew, demonstrated the accuracy of this assertion. He might now refer to Mr. Russell's remarks upon the temperature at night as influenced by the dew point. The temperature at night was found to be but little different from the dew point which might be observed in the course of the day. The true explanation of that was to be found in Well's theory of dew. A blade of grass could not go to a temperature lower than the dew point of the air touching it, and so was it

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with particles of mist. Dew was most plentiful in clear calm nights, when the air was very moist, but quite transparent, and when it fell fine leaves of flowers and grass blades could not sink lower than the dew point. Dew did not form to any great degree, indeed hardly at all, when the sky was cloudy, for then the clouds afforded the protection which was not on such nights afforded by the dew. When there was no clouds, and if there was a high wind, then in that case the wind afforded the protection to the leaves and flowers which was to be obtained from neither dew nor clouds. (Applause.) But by an arrangement which they could not but regard as an admirable and wonderful exemplification of design, there was nothing destitute of protection. The protection was sometimes insufficient, and plants were killed by frost; but some degree of protection was never wanting, and there was enough of that protection always to allow plants to live, as we saw them doing, and to survive during weather when, were it not for one of these three causes, the cold would be so great as to destroy them altogether. (Applause.) Physically, it was interesting to remark how it was that in each instance the protection was obtained. There was first the protection afforded by clouds. These prevented the surface of the earth from radiating and reaching a lower temperature than that of the clouds. The temperature of a blade of grass on a cloudy evening would therefore be very nearly the temperature of the lower surface of the clouds overhead. When there were no clouds and no wind, the office of each blade of grass was to collect the air touching it, condense vapour from that air, and so take heat from part of the heat around it. Thus we had a source of heat taken from the air several feet above the surface. The protection was more complete, however, when dew did not fall, for when there was no dew the wind made up so large a portion of heat from the air that the leaves of plants were never allowed to go down even to the dew point. Thus wind was a more complete protection than dew, and it would have been observed that plants were never injured by frost on windy nights, and that in the morning the grass was found dry. (Applause.) It was sometimes remarked that flowers were frosted in hollows, but that close at hand, and on the summits of little hillocks, they escaped damage. The explanation was clear when they took into account the principles developed by Wells. The air in the hollows remained unchanged, and unless there was moisture enough in the air to provide dew as long as the severe condition of weather lasted, and to keep the dew point from going down too low, injurious effects would follow. The plants, in short, got dry, drying the air around them, and if that air was not changed very much for the better, then they were destroyed by frost. This, however, rarely happened. He agreed with Mr. Russell in what he had said regarding the value of Dr. Tyndall's work on "Heat." The scientific world were much indebted to Dr. Tyndall, not merely for his investigations, but for the manner in which he had attracted interest to the results of science, and for the beautifully clear explanations he had given of scientific principles. Scientific men were extremely dependent on the sympathy of the rest of the world, and this was very largely increased when the illustrations of scientific investigations were made known in a clear and interesting manner, as Dr. Tyndall had made them known, to a very large part of the population in this country, and throughout the civilised world. (Applause.)

YELLOW HAZE & S.E. WIND.

To the Editor of the Meteorological Magazine.

SIR.—As regards your correspondent T.L.L.'s letter relative to the above, it appears to me that the explanation of the peculiar haze which accompanies (as I too have invariably observed) an easterly wind, is to be sought for in a consideration of the characters of that wind; these are—dryness, coldness, and consequent density, with but a small capacity for vapour.

The effect of its dryness—the result of its passage across land, and of its coming from intensely cold regions—is excessive evaporation. But the vapour drawn up in this way is immediately condensed, before it can reach to any height, by the extreme coldness of the air, not in the form of cloud, but as a haze of a most peculiar *bronze* hue.

And this is the more marked in Spring, because at that season the coldness of

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the N.E. current is greatest, and the amount of vapour carried up by evaporation reaches a maximum, from the sun, with increasing power, acting on the land drenched by the winter's snow and rain.

With respect to the S.E. wind; in the first place, we must carefully distinguish two distinct forms of the same. The one is nothing more than a *bent polar* or N.E. current, and is accompanied by all its characteristics, namely: a *high* barometer, great cold, the usual bronze hue, dry weather, &c. The other is a deflected S.W. or *equatorial* current, and is attended with a *low* barometer, warmth, moisture, and often heavy rain.

Now the March S.E. wind is the result of an enormous expansion of air due to the commencing increase of temperature over the vast extent of Northern and Eastern Europe, and of Asia.

These easterly winds constitute the spring equinoctial gales, and are generally followed by a reactionary succession of high winds from the west, which give to April its character of "showery."

In October we meet with both forms of S.E. wind, the first, or deflected N.E., occurs as a reactionary equinoctial after the S.W. gales of September, which latter find their origin in the rapid fall of temperature towards the north and east.

This form of S.E. wind is not so often met with in October as is the second, which, again, is noticed under two aspects; first, as forming one side of a cyclone (and this is the more usual), and secondly, as a comparatively steady wind, the result of an equilibrium established by opposite currents from N.E. and S.W. holding each other in check.

If in the second case there is no intermingling of the currents, we have towards the S.W. border of the S.E. wind, the conditions mentioned by your correspondent—viz.: a singularly transparent air and large quantities of cirrus, and towards the N.E. edge of the same the haze and high barometer characteristic of N.E. wind.

Under such circumstances it is possible that air from the deserts of Africa may cross the British Isles.

Should the currents mingle, we have drenching rains with a low S.E. wind, and a high S.W. current, the latter naturally prevailing in the higher regions of the atmosphere by reason of its comparative lightness; this is the state of things during a cyclone too.

And now I would briefly refer to Dr. Moffat's most interesting papers on Ozone, abstracts of which you have kindly given in the *Meteorological Magazine*.

You may remember that in a letter written some 14 months ago, I asked for information concerning a phenomenon I had noticed—the occasional discolouration of paint by rain. In that letter I gave the conditions under which that phenomena always occurred; they were briefly—the prevalence of an under wind from S.E., an upper current from S.W., a very low barometer, and an excessive rainfall. I also suggested that this remarkable fact might be explained by the presence of a large quantity of ozone in the air at the time.

Dr. Moffat has ascertained that the equatorial current, especially when blowing over the sea, is that of most ozone. Is not this confirmatory of the ozone theory of discolouration of paint? That ozone is intimately connected with the electrical state of the air is again borne out by the fact that the equatorial current is at the same time that of maximum ozone, and also the bearer of thunderstorms; to have thunder and lightning with a pure N.E. current is a most unusual phenomenon.

I will only add that on the night of the 11th of July last, the sea off Kingston and Bray was splendidly phosphorescent, while at the same time a violent thunderstorm was raging in the immediate neighbourhood.—Yours very truly,

JOHN WILLIAM MOORE, B.A., Sch. T.C.D.

P.S.—The colour of the east wind haze was for a long time a puzzle to me, until I one day observed that the inner edge of a solar halo was of an exactly similar tint. The bronze is the representative in the halo of the orange in the rainbow. A peculiar arrangement of the vapour particles forming the haze, no doubt gives rise to its colour.

9, Trinity College, Dublin, *October 22nd*, 1867.

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OCTOBER, 1867.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Date.	Days on which 01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of nights below 32°.
			inches	inches.	in.							
I.	ENGLAND.	Camden Town	1·92	— ·68	·42	15	16	66·0	22	31·0	6	2
II.		Staplehurst (Linton Park)	2·65	— ·45	·77	16	16	68·0	15	29·0	5, 6	7
,,		Selborne (The Wakes)	3·68	— ·54	·57	15	19	58·5	17	26·0	11	5
III.		Hitchen	1·78	— ·77	·37	27	17	63·0	22*	30·0	4	3
,,		Banbury	2·94	+ ·51	·59	11	24	64·0	22	29·0	11	3
,,		Wisbech	2·31	...	·51	15	20	66·6	22	30·8	6	3
IV.		Bury St. Edmunds (Culford)	2·48	— ·24	·44	15	17	65·0	22	27·0	4	5
V.		Calne	...	...	...	...	...	...	...	...	...	...
,,		Plymouth (Goodamoor)	6·47	— ·20	...	...	...	62·0	...	28·0	...	...
,,		Barnstaple	7·12	+ 3·00	1·11	29	26	66·0	23	37·0	11	0
,,		Taunton (Fulland's School)	3·38	— ·16	·52	10	24	...	...	37·0	26	0
VI.		Shrewsbury (Highfield)	2·93	+ ·05	·61	9	19	...	...	...	...	...
,,		Tenbury (Orleton)	3·20	— ·03	·62	9	28	65·4	22	32·2	20	0
VII.		Leicester (Wigston)	2·29	— ·41	·41	12	16	68·0	22	27·0	4	6
,,		West Retford	...	...	...	...	..	...	...	...	...	...
,,		Derby	3·30	+ ·46	·76	11	21	65·0	22	33·0	4	0
VIII.		Manchester	3·98	+ ·17	·75	27	22	69·5	22	30·5	4	4
IX.		York	1·41	— 1·11	·26	28	18	61·0	16	32·5	6	0
,,		Skipton (Arncliffe)	4·99	— 1·67	·60	16	24	59·0	23	32·0	9, 28	0
X.		North Shields	1·07	— 2·21	·19	4	16	...	...	...	...	0
,,		Borrowdale (Seathwaite)	13·67	— 2·65	2·25	29	22	...	...	...	...	...
XI.	WALES.	Abercarn	5·20	...	·74	18	21	62·0	2	37·0	11	0
,,		Haverfordwest	8·54	+ 3·35	1·09	15	23	60·5	22	37·5	3	0
,,		Rhayader (Cefnfaes)	...	...	...	..	...	...	...	..	...	...
,,		Llanberis (R. Victoria Hotel)	10·14	...	1·00	5	23	...	...	...	...	...
XII.	SCOTLAND.	Dumfries	4·01	— ·91	·68	15	23	62·5	22	29·5	28	5
,,		Hawick (Silverbut Hall)	1·39	...	·29	26	17	...	...	...	...	7
XIV.		Ayr (Auchendrane House)	5·10	+ ·15	·77	20	25	64·0	2	27·0	4	4
XV.		Otter House	10·97	+ 4·49	...	...	26	...	...	27·0	28	2
XVI.		Leven (Nookton)	1·99	— 1·76	·46	14	16	64·0	22	31·4	28	3
,,		Stirling (Deanston)	4·33	— ·58	·83	26	23	65·0	22	26·0	10	6
,,		Logierait	2·89	...	·82	26	18	...	...	...	...	..
XVII.		Ballater	2·83	...	·66	13	16	68·5	11	24·0	6	8
,,		Aberdeen	2·08	...	·50	14	23	61·0	22	30·9	6	1
XVIII		Inverness (Culloden)	2·76	...	1·11	27	21	62·2	...	34·2	...	0
,,		Fort William	11·83	...	2·57	26	28	...	...	...	...	...
,,		Portree	9·68	— 1·10	2·45	26	25	62·5	11	31·5	5	1
,,		Loch Broom	8·35	...	2·25	26	25	...	...	...	...	...
XIX.		Helmsdale	...	...	...	...	...	...	...	...	...	...
,,		Sandwick	6·66	+ 1·74	1·18	26	28	57·0	24	35·1	4	0
XX.	IRELAND.	Cork	4·66	...	·57	16	27	...	...	...	...	...
,,		Waterford	3·88	— ·52	·73	23	24	64·0	10†	37·0	4	0
,,		Killaloe	7·63	+ 2·61	1·39	22	26	63·0	12	32·0	28	0
XXI.		Portarlington	3·51	— 1·62	·60	24	28	60·5	23	34·0	28	0
,,		Monkstown	2·50	— 1·42	·37	9	20	67·0	22	33·5	4	0
XXII.		Galway	5·29	...	·57	27	28	62·0	2	34·0	14	0
,,		Bunninadden (Doo Castle)	7·27	...	·80	13‡	25	59·0	11‡	31·0	26	1
XXIII		Bawnboy (Owendoon)	6·28	...	·76	13	28	65·0	11‡	31·0	3	1
,,		Waringstown	4·15	...	·53	9	25	66·0	22	31·0	27	1
,,		Strabane (Leckpatrick)	7·96	...	·97	26	25	66·0	12	30·0	25	1

*And 24th. †And 12th. ‡And 22nd.

+ Shows that the fall was above the average; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

CAMDEN TOWN.—Gale with H and heavy R at 1.10 p.m. on 27th.

LINTON PARK.—First ten days cold, with several frosty mornings; T and heavy R on night of 15th. Very dry, mild and fine from 19th to 26th; the last few days moist but mild. Wind mostly S. and W. High wind and heavy R on afternoon of 27th.

SELBORNE.—T S from S. at 6 p.m. on 3rd; T S also on 9th, and at 3 p.m. on 18th; H storm at 12.30 p.m. 8th; distant T at 4 p.m. 14th; dense fog on 25th.

HITCHIN.—Tremendous R on 27th [for a short time], almost like a water-spout.

BANBURY.—H and R on 3rd and 27th.

WISBECH.—Aurora at 11 p.m. on the 2nd. Early part of month cold; from 21st mild and humid. The late swallows departed on the 19th. Solar halo on 9th; fog on 12th and 24th; gale on 27th. Lime trees divested of leaves on 23rd.

TAUNTON.—H storm on 3rd.

ORLETON.—S on the hills on 5th. Month generally cloudy and damp, with frequent fogs and small R almost daily. The beginning of the month very cold; afterwards changeable, but generally warm; great wind on 27th; distant T S at night on 17th, and T on 19th. Temp. nearly 1°·5 below the average; H storm at 10 a.m. 3rd; heavy R and H for twenty minutes at 9 a.m. 27th.

MANCHESTER.—T and L on 7th; H and heavy R on 27th.

ARNCLIFFE.—Wild, with gale of wind on 2nd; R frequent, though not heavy.

NORTH SHIELDS.—S on 4th and 5th; auroræ on 2nd, 3rd, and 8th.

WALES.

ABERCARN.—A wet month, generally cold, but some close days. Boisterous on 21st and 27th. H shower on 4th.

HAVERFORDWEST.—The first ten days cold, wet and stormy, with heavy H storms, and wind N.N.W.; remainder of month wet; at times very close atmosphere. The wettest October of which I have any record during the last 20 years; only three fine days during the month. Prevailing wind S.W.

SCOTLAND.

DUMFRIES.—The beginning of the month fine, with some frost. From the 11th to close of month R every day but two. Harvest concluded in higher districts the first week in the month. The potatoe crop in some cases much diseased, in others but little; on the whole the crop is above the average, though the tubers are small.

HAWICK.—A hurricane from the West on the 1st, 2nd, 26th, and 27th; during that of the 26th many trees were torn up. Frost on seven nights at the commencement. Swallows last seen on the 5th; last dish of peas on 26th; cereal crops all safely housed by the middle of the month; turnips looking well. The month on the whole has been dry and mild. H on 4th.

AUCHENDRANE.—Harvesting has been a difficult operation, and the late crops have been damaged, as the weather, even when not raining, has been calm, cloudy, and damp.

OTTER HOUSE.—A rainy month. Crops secured, but much damaged; potatoe disease prevalent, half of them being useless.

NOOKTON.—A fine month; stormy from 12th to 17th, and on 22nd and 26th.

DEANSTON.—Gale from W. on 2nd and 27th, with heavy R. Month generally damp, but good weather during daylight for some part of the month. Leaves fell rapidly towards the end of the month.

LOGIERAIT.—The commencement of the month very favourable, concluding the finest harvest weather experienced for many years. The first S of the season seen on the hill tops on the morning of the 3rd. Severe frost on the night of the 24th. Heavy R, with a severe gale, on the night of the 26th and morning of the 27th.

BALLATER.—Lunar rainbow on 14th; meteor at midnight on 23rd. The weather at the beginning of the month was very stormy, and an unexpected fall

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of an inch of S occurred on the 4th, but disappeared in the course of the day. Severe frost on the 6th. A remarkable improvement took place in the second week, the temp. on the 11th being 68°·5. The remainder of the month continued favourable for harvest, and by the end of the month the crops were secured in good condition.

ABERDEEN.—Auroræ on nine nights. Bar., temp., and R below the average; wind force rather above it. The first part of the month was very cold. T S with H on morning of 3rd; L on 18th. Bar. 28·885 on 27th.

ROSSE PARSONAGE, FORT WILLIAM.—S on Ben Nevis on the 1st, on the lower hills on the following day, and again on 7th. A wet and boisterous month; it began with S on the hills and went on with wind and R to the end of the month, there being only three days on which R was *not* registered; the total fall was 11·83, as compared with 6·85 in 1866, and 2·80 in 1865. On Saturday the 26th, a fall of 2·57 was registered, by far the heaviest fall in 24 hours since observations have been taken here, it is said to have been the wettest day known here for 30 years; since the 15th of August only nine days have been without R.

PORTREE.—This month has been wet, stormy, and cold, and not (as usual) favourable for the Highlandman's harvest, on the contrary the greater part of the crops are still unsecured, but the weather being so cold there is no second growth in the stooks; the potatoes are not so plentiful as was at one time expected, they are small in size, not so rich as usual, and a good deal diseased. Fine lunar rainbow on the 11th; first fall of S on the 3rd, and frequent H ever since; heavy gale on 1st from W.

LOCHBROOM.—The farmers here have had a trying year—a bad spring, late harvest, and October with only six fine days. Very wild and stormy at the beginning and end of the month. T S on 31st.

SANDWICK.—October has been a cold and wet month, indeed the wettest on record except two; high wind on the first 3 and last 5 days; hills white with S on 8th and 28th; auroræ on four nights, but particularly brilliant on the 18th at 10 p.m. Gale 50 miles an hour on the 2nd. H on 2nd, 3rd, and 4th. Solar halo on 16th.

IRELAND.

KILLALOE.—The greatest rainfall in October in 22 years, the other heavy falls being 6·85 in 1846, 7·61 in 1862, and 6·22 in 1863.

MONKSTOWN.—Remarkable variations of temperature; from 3rd to 10th bitterly cold, milder to 22nd, which was very close and heavy; this was followed by heavy gales on 27th at 3 a.m., and 28th at 10 p.m.

DOO CASTLE.—An exceedingly wet rough month; low-lying lands much flooded; hay and oats not harvested before the beginning of the month now present a sad spectacle. The night of Saturday the 26th was tempestuous in the extreme, with showers of H, H also fell on 3rd.

OWENDOON.—More R has fallen than in any month since January, 1866. The 26th was very wet and squally.

WARINGSTOWN.—The whole month was showery, and very unfavourable to farming operations; there was scarce any evaporation, and the ground became so wet as entirely to put a stop to the preparing for and sowing of wheat. Heavy gale on the night of the 26th.

LATEST INTELLIGENCE.

Meteor Shower of November 14th.—We have only time to state, that from 2.30 to 8 a.m., the sky was so obscured by mist and cloud that even the moon was quite invisible at Camden Town.

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CATOR'S LEVER ANEMOMETER.

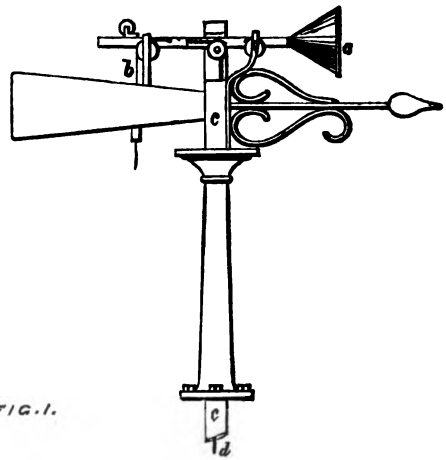
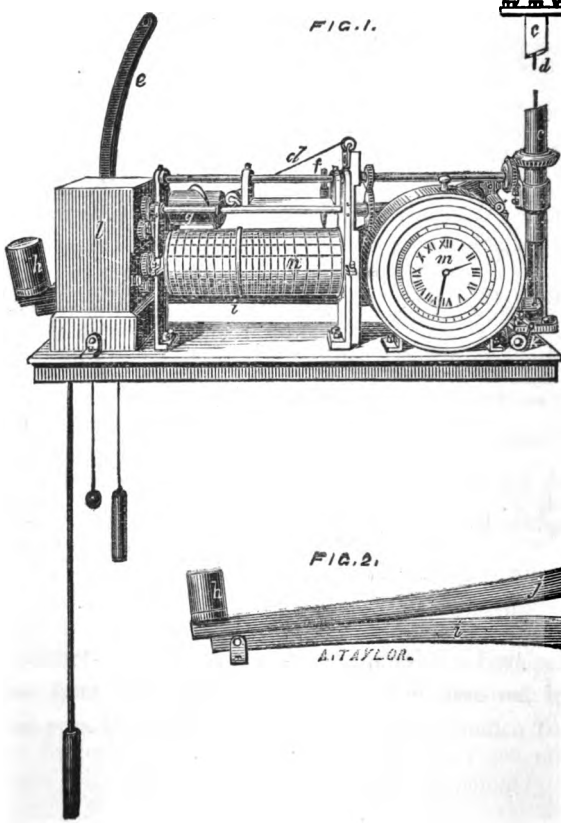


FIG. 1.



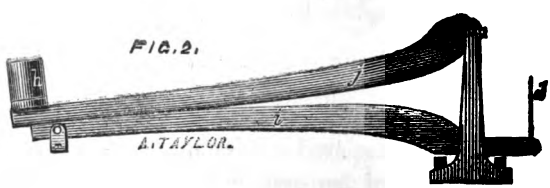


FIG. 2.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

XXIII.] DECEMBER, 1867. [PRICE FOURPENCE. or5s. per ann. post free.

ANEMOMETERS.

(Continued from page 113.)

OUR survey of pressure anemometers will terminate with the latest, and in some respects the best—Cator's Lever Anemometer—which will be readily understood from the following description.

The outline sketch (Fig. 1) shows the only portions of the instrument exposed to the weather to consist of, a stout hollow pillar, containing a tube (*c*), which is attached to the vane and conveys its motion to the recording apparatus below; above the vane a horizontal bar will be noticed, terminating at one end in a cone, whereof the base (*a*) has an area of one square foot, and which is kept constantly face to wind by the vane; this plate receives the full force of the wind, and by it is driven towards (*b*), but in so doing it draws up the chain, which (part of *c* being cut away) is seen passing inside it, and continuing its downward course at (*d*). A string (*b*) will be noticed passing over a pulley at the back, and dropping through a pipe in the middle of the vane; this is arranged for affording extreme facility for testing at any time the accuracy and sensibility of the instrument, since it is only necessary to attach various weights to the string (*b*) accurately to imitate force acting on (*a*); and it is obvious that 3 lbs. attached to (*b*) should be so recorded on the register below.

We will now, referring to the shaded sketch, fig. 1, consider the arrangements indoors; these consist of three parts:—the clock (*l*), the sole duty of which is to turn the paper-covered cylinder (*n*) on its axis once in 24 hours. There is the tube (*c*), which as already explained revolves with the vane, and therefore conveys the direction of the wind through the mitred wheels at its base, and one or two cogs, to the drum (*g*), round which a single spiral will be noticed, which is formed of brass and presses gently upon the prepared recording paper (*n*). Therefore every variation in the direction of the wind causes a different part of the spiral to press upon the paper, and as the cylinder (*n*) is continually revolving, the exact time and nature of every change is infallibly recorded.

The special recommendation of this instrument is its record of pressure, which is obtained in the following manner:—It has been

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explained that the force of the wind pressing on (*a*) drives it back, and in so doing raises the thin wire (*d*), this brings into play the double levers (*i*, *j*), shown also separately in fig. 2, the upper lever (*j*), when raised, passing between two guiders (*e*), the special recommendation of these levers being that, owing to their peculiar curvature, the point of contact travels farther and farther from the weight (*h*), the greater the pressure exerted; by this means great sensibility is obtained in light winds, and yet strong ones are recorded accurately and compactly.

Having thus shown how the force is counterpoised, it remains to explain that it is made to record itself by two cords fastened to the end of the lower lever (*i*), near the lower extremity of the wire (*d*)—one of which passes behind the clock (*m*), over two pulleys, and draws the recording pencil (*f*) more or less away from the edge of the paper, according to the amount of the pressure at each instant; the other string passes under the pulley (*k*) and into the clock (*m*)—called the gaining clock—to the regulator of which it is attached. This is a clock of superior quality, arranged to go exactly 24 hours in 24 hours *if the regulator is at zero*, but the string only allows it to be there in a perfect calm, and at all other times it is pulled more or less towards '*fast*;' therefore, this clock always gains more or less, and the amount of gain is a direct measure of the mean force. This clock is figured in the usual manner, but of course is *not* an indicator of time. By repeated and varied experiment the exact gain corresponding to various *constant* pressures was determined, and therefrom an outer scale marked on the clock face, which gives therefore by simple inspection the exact mean force of each 24 hours—an element never before truly determined.

The advantages of the instrument are very fairly summed up by the inventor in the *Proceedings of the Meteorological Society*; we therefore quote the paragraph in its entirety:—

Advantages.—It remains to consider the peculiar advantages of this instrument. The *advantages* which this instrument has over other anemometers *in general* now in use, are the combination of pressure and velocity, the wind acting on *one* surface only; and over other *pressure*-anemometers, that the only parts out-of-doors and exposed to the weather are the pressure-plate and vane, all the rest of the instrument comprising all the working apparatus, and the levers, which are the resistance to the force of the wind, being inside the building, and protected from the weather; whereas the springs which are the resistance to the force of the wind in other pressure-instruments are out-of-doors behind the pressure-plate, and therefore very much exposed to the action of the weather, liable to rust, &c.; now a lever is preferable to springs for this purpose in *any* position, because springs cannot keep their original strength for ever, but must get weaker from age and constant use, and besides are liable to be too stiff from rust and accumulated dust and dirt; and springs indoors are preferable to springs out-of-doors, therefore, *a fortiori*, a lever indoors is preferable to springs out-of-doors. We now com to one of the peculiar features of this instrument, in that, while it is capable of the greatest susceptibility, it also exhibits, without being impaired, the greatest pressure of wind that has yet been brought to bear upon it. A pressure of wind of

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only $\frac{1}{10}$th of a pound will cause the pencil to move through an appreciable space (*i.e.* about $\frac{1}{20}$th of an inch), while at the same time the instrument will bear a pressure of even 56 lbs. or more if required, and the pencil will show it, the whole scale being comprised in a space of $5\frac{1}{2}$ inches; a large portion of the scale being devoted to the lower pressures, *i.e.* about 1 inch to the first 2 lbs., which allows space enough for small fractions of a pound to be measured, and the spaces gradually diminishing for each pound as the numbers rise, where indications of integral pounds only are wanted, and fractions not required; whereas springs, which are strong enough to bear a pressure of 20 or 30 lbs., will not show any pressures generally under $\frac{1}{2}$ lb. In some instruments the spaces allotted throughout the scale are nearly equal for high and low numbers, which makes it impossible to record the small pressures, even if the instrument were sensitive enough otherwise to indicate it. Again, strong gusts of wind will be plainly indicated by this and other pressure-instruments, but are hardly discernible in the velocity-curve of a cup anemometer. Again, a pressure-plate, with a conical back to it, is preferable to one without it, as it will be more easily moved through the air with a very slight pressure of wind, as being pointed, it will cut through the air more easily than the ordinary plate, which, having a flat surface, must take a greater pressure to do so; and the consequence is that in very light pressures the ordinary plate will either not be moved at all, or will not be pushed through far enough, and therefore the pencil will show either no pressure at all or too small a pressure. And when we come to strong winds, a plate with a conical back to it is not subject (or at any rate it is much less subject) to the errors arising from, and false results given by, a partial vacuum being created behind the plate by gusts, which would be so in the case of a plate without a conical back; for when a strong gust comes, a partial vacuum is created behind the plate, and the consequence is that the plate is pushed through too far, and therefore too great a pressure is shown by the pencil. The error arising from this must, it should seem, be considerable. Again, the "gaining-clock," independently of the velocity, is designed to show the *exact* mean pressure, or the mean of an *infinite* number of observations, instead of only an *adopted* mean pressure, or the mean of twenty-four or any other certain or *finite* number of observations, as in other pressure-anemometers. In addition to the above advantages, the combination in this instrument of pressure and velocity dispenses with the necessity of using, at the time of making observations, a book of tables for their conversion; for the "gaining-clock" itself gives the results of the claculations which would have to be made for converting pressure into velocity.

We have only to add, that the instrument was tried at the Royal Observatory, Greenwich, with the most satisfactory results, and that the one represented in the engraving is now working most admirably at Mr. Cator's residence, at Beckenham. The instrument is made by Mr. Adie, but we have no exact knowledge as to cost

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THE TORTOLA CYCLONE OF OCTOBER 29TH, 1867.

NOT having any correspondent in the district which has lately suffered so severely, we have been obliged, in preparing the following short narrative, to rely upon a series of extracts from the daily and weekly journals. We have, of course, no information as to the quality of the barometers of which the readings have been forwarded, but they appear to have been good, as the indications are very accordant, excepting only the barometer on shore at Tortola, which evidently has the common fault of insufficient cistern space, whereby it ceases to act just when it is most important that it should be correct. Another difficulty is that arising from the effect of the phenomena on those who are in their midst. In the present case there is a singular illustration

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of the mental effect of such catastrophes, in that several writers have spoken of so many hours, quarter hours, &c., as to amount in the aggregate to nearly double the real duration of the hurricane even as given by themselves. We all know how "minutes seem like hours" under certain circumstances, and it is no wonder that errors of this kind have occurred. It is deeply to be regretted that there was neither observatory nor anemometer at either of the isles; known as they are to lie in the stereotyped track of West India hurricanes, it seems strange no instruments have ever been provided. However, if they had, they might have shared the fate of the instruments at Calcutta, in the storm of October, 1864, when the native in charge became possessed of the idea that the world was coming to an end, and therefore, that it was superfluous to take any more observations.

We propose to epitomize the history of the storm at Tortola, and at St. Thomas, and to conclude with a few general remarks.

Tortola.

"Tortola was submerged for eight hours. All living things perished." So said the telegram, but happily it was an outrageous exaggeration. The meteorological details from Tortola are very meagre, and the only shore observations evidently worthless, since the barometer only fell to 29 inches, while two others in the neighbourhood were below 28 inches, and a third in the harbour 28·10 in. The wind freshened from N. by W. soon after 9 a.m. on 29th, at which time the barometer was nearly 30·0 inches. By noon it had fallen to 28·70, and the wind was blowing a hurricane from N. by W. At 12.30 it had fallen to 28·10, and the wind fell calm. In twenty minutes the wind rose again from S. by E., and blew very hard—the barometer rising all the time. At 3 p.m. the wind moderated, and by 5 p.m. the barometer had risen to 29·45. There was very heavy thunder throughout, and intense darkness. In less than three hours, two-thirds of the houses, including the Governor's, Doctor's, and Clergyman's, the gaol, church, hospital, &c., and all the crops, were destroyed.

St. Thomas.

The season had been wet and very sickly. Seven inches of rain fell at Barbadoes on the night of October 7th, and 5·00 on another night. At St. Thomas there was a fresh wind on the evening of the 28th, and it increased till 1 a.m. on 29th, when it fell calm, remaining so until about 6 a.m. of 29th, when it blew in puffs accompanied by rain. This continued till 9.30 a.m., when it blew very strong. The hurricane began at noon from N.W. A lull of thirteen minutes' duration occurred about 1.30 p.m., then the wind chopped round to S.E., blowing even harder than it had previously done from N.W., and by 3.45 p.m. it passed away, though the sea continued high, and it rained heavily until the morning of the 30th.

The barometer at St. Thomas was about 30 inches until noon, and fell rapidly until about 2.30 p.m, when it was only 27·9. It will therefore be seen, that the minimum reading occurred *after* the centre of the storm had passed. Several shocks of earthquake were felt, and

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the atmosphere was so strongly electrical, that the ships' compasses were useless.

Measures of Wind Force.

This element is far too easily supplied. Disasters which in the West Indies are spoken of as unparalleled, and which even English liberality cannot repair, are but too abundant. Harbours strewn with wrecks, houses unroofed, sheds carried away, these are common results—but happily it is rare to find in a lane "tons of broken wood, an anchor. several cart wheels, a pianoforte and slabs of marble, which, when the storm was at its height, had been seen whirling round in the air like sheets of paper;" yet stranger is it to read, that the "dining room of the house belonging to the Royal Mail Company's superintendent was hurled into a neighbouring garden, where it was discovered with the furniture, lamps, and decanters uninjured."

Probable Track of the Storm.

Up to the date of writing, we have only heard of the storm at Anguila, the Virgin Isles, Calebra, and Porto Rico. It did not reach St. Croix, 25 miles South of St. Thomas. When last heard of, it was "going direct for Turk's Island and the Bahamas." But another account says that it did much damage at St. Domingo. There is evidence in support of both statements; for the former, in that the mean axial path of hurricanes passing over the Virgin Isles is about W. 25° N, which would take the storm "direct to Turk's Island." On the other hand, the entire escape of St. Croix, and the directions of the wind as recorded at Tortola and St. Thomas', indicate a W.S.W. path rather than the usual W.N.W., and then St. Domingo would suffer.

Collating eleven hurricanes in N. lat 10° to 20°, and W. lon. 60° to 70°, we find that their paths were mostly from E.S.E. to W.N.W., and that the centres of five passed over St. Thomas, four were at a mean distance of 3° S.W. of the island, and two passed about 1½ N.E. of it, thus showing how completely St. Thomas lies in the storm path of the West Atlantic.

Singular Parallelism between the Damage at St. Thomas and Tortola, in 1837 and 1867.

"At Tortola the town was destroyed; at St. Thomas the hurricane of August 2nd concentrated all its fury, the state of the harbour and town baffles description. The harbour is so choked with wrecks and sunken vessels, that it is difficult to pick out a berth for a ship to anchor. Some houses were turned regularly bottom up. One large well-built house was carried by the force of the wind from off its foundation, and now stands upright in the middle of the street. In the midst of the hurricane shocks of earthquake were felt. Calm period lasted ten minutes. Every vessel but two, wrecked or ashore. No barometer observations at Tortola or St. Thomas, but at Porto Rico, it began to fall slightly at 4 p.m., at 8 p.m. was 29·6, at 9 p.m. 29·5, 10 p.m. 29·4, 11 p.m. 29·3, midnight 28·0, then turned to rise, and at 4 a.m. next morning was 29·5."—*Col. Reid's Law of Storms.*

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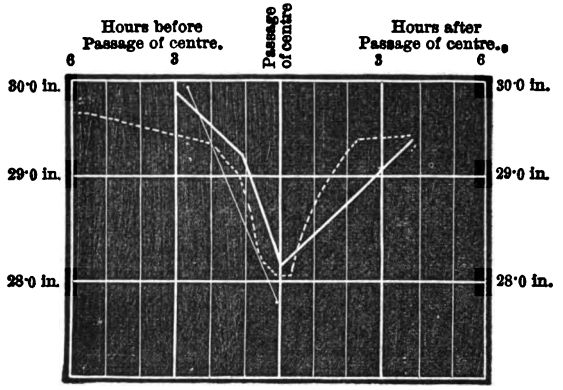
The foregoing is an abstract of the log of H. M. Packet, *Spey;* giving an account of the effects of the cyclone of August, 1837, which so closely agrees with the present disasters, that it would describe *them* better than any single account yet published. An equally remarkable agreement exists between the barometer depressions, in 1837, at St. Thomas', as given by Piddington, and the readings (corrected an obvious error) transmitted in 1867. The following diagram shows this very clearly. The dotted curve is 1837, from Piddington's Horn Book.



The thick curve from ship observations at Tortola in 1867, and the single faint line shows the fall recorded at St. Thomas in 1867. In each it will be seen the barometer was previously at about 29·8 or 30·0, that it began to fall more than 0·10 per hour, some three hours before the height of the storm, and that during the two hours immediately before the passage of the centre, the fall was at the rate of *three-quarters of an inch per hour*; and lastly, all the readings concur in giving the minimum as between 27·9 and 28·1 inches.

It will be noticed that in both 1837 and in 1867, shocks of earthquake are mentioned. We need hardly point out that when the wind force is so furious, it must be very difficult to distinguish between vibrations resulting from it, and from subterranean disturbances. We may notice, moreover, that the West Indian Isles are mostly volcanic, and reference to Mallet's Seismographic Map of the World (British Association Report, 1858) confirms the commonly received opinion that earthquakes are of especial frequency in these islands. In fact another occurred within three weeks after—on 19th of November. A writer in the *Standard* has renewed the suggestion that real earthquakes may be caused by the extremely sudden removal of the consolidating atmospheric pressure—say 2 inches in three hours, which is more than 1,500,000 tons per square mile. We doubt this altogether, and think a slight consideration will render its absurdity obvious.

The specific gravity of mercury is 13·5; that of the surface of the earth may be taken at 2·1; therefore a fall of 2 inches in the barometer equals a removal of a layer of earth 13 inches thick. If such a removal is sufficient to cause a disturbance of the earth's crust, one would

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think that there must be great danger at St. Thomas in sinking wells, lest instead of drawing water, they tap a volcano, and draw up melted lava.

Postscript, December 12th.—In the *Times* of the 10th is a letter from Mr. R. H. Twigg, at present engaged in erecting a lighthouse on the Island of Sombrero, of which the following is an epitome :—

"The hurricane began gently from N.E. about 1 a.m. 29th, and at 5 a.m. it blew hard from N.W., and the barometer had fallen half an inch; by 8 a.m. it had fallen to 28·65 in. (a decrease of 1½ inches), and the wind veered to N., increasing in force. From 8 to 9 the storm greatly increased, and a large portion of the wooden buildings were carried away. Then there was a lull for half an hour. The barometer by 9 o'clock read 29·95 [? Ed.], but the storm continued with even greater than its previous violence from E. till 11 a.m., when it abated sufficiently to allow a few persons to venture out. After that the wind went round to S.E. for about two hours longer. The anemometer had three of its arms broken, and the other twisted."

In the *Express* of the 11th is the following abstract of the account sent home by "the scientific authorities" at St. Thomas :—

"At 6 a.m. on the 29th the weather was squally, but the aneroid was at its usual height, viz., 29·95. Soon afterwards the barometer fell slightly, the wind freshened into squalls from the N., and much rain fell. At 9 the barometer was at 29·84. It continued to fall after this, and the wind veered to the east. At 10 the aneroid was at 29·80, and it then began to alter rapidly; in fact, the hand could be observed moving. Precisely at noon the wind increased to a hurricane, blowing steadily from N.N.W. ½ W., and the aneroid was at 27·95 deg., indicating a fall of two inches of the mercurial column in six hours. At 12.15 there was a dead calm, which lasted 25 minutes. At 12.40 it was pitch dark, and there was a rush of wind from S.S.E. ½ E. After 1 p.m. the barometer rose, and at 1.30 the weather improved. At 2 the barometer rose rapidly, the wind continuing steady at S.S.E. ½ E. A remarkable peculiarity of the cyclone was that it commenced blowing from an opposite point of the compass from ordinary West India cyclones.

These confirm the views above expressed, and accord with the narratives from other places. We may, therefore, say that so far as present information enables us to judge, the disasters were produced by a true cyclone, revolving in the usual manner (against watch hands), and travelling in a more southerly direction than is usual in the district whence alone we have yet heard of it.

THE METEOR SHOWER OF NOVEMBER 14TH, 1867.

We regret to state that our own report of the total eclipse of the meteors, applies to all parts of the British Isles of which we have yet heard, with three exceptions—Greenwich, the North Foreland, and Aberdeen. At Greenwich ten were seen through breaks in the clouds between 5 and 7.30 a.m, At the North Foreland several meteors were seen about 6 a.m.; and at Aberdeen there were a few breaks in the clouds between 5 and 6 a.m., and ten meteors were seen, one of which was so bright as to be visible through a thin cloud.

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From Paris, the reports are contradictory. *Galignani* says:—"Between 1 and 3 in the morning the number of aerolites was so great that they could not be counted." On the other hand, the Observatory authorities have not published any observations, and we have been told that "the Paris correspondent of the *Daily Telegraph* reported that he had looked out at all sorts of unearthly hours, seen nothing, and got a cold for his pains." Another *on dit* is, that a party went up from Paris in a balloon (to be nearer the meteors?) but came down crest-fallen, having seen nothing!

At Toronto, Mr. Kingston reports:—"Overcast until 1 a.m. 14th, after which in consecutive hours until 6 a.m. the numbers were—44, 123, 560, 1345, 195—total, 2267—many of which were very bright; maximum frequency at 4.10 a.m., the *rate* being 2500 per hour."

At New York, most frequent at 4 a.m., at the rate of 1500 per hour.

At Washington Observatory, the display is said to have been the most brilliant in that country since 1833. Maximum frequency at 4 25 a.m., the rate being nearly 6000 per hour. Many of the meteors were remarkable for their brilliancy, and for having a brilliant greenish train, which usually vanished in a few seconds, but in one or two cases lasted several minutes.

THREE STRANGE STORIES.

FALL OF AN AEROLITE.—On Monday afternoon, the attention of the inhabitants was suddenly drawn seaward by what sounded like a signal gun. Those persons who happened to be upon the parades were startled by perceiving an aerolite descend into the sea at some distance. Thunder was subsequently heard, and evidences of strong atmospherical disturbance were plentiful.—*Margate, October 14th*, 1867.

SHOWER OF SULPHUR.—The inhabitants of the village of Thames Ditton, Surrey, were, on Friday night, October 18th, 1867, a good deal startled at witnessing a very strange phenomenon, which had the appearance of a shower of fire. The shower lasted about ten minutes, and during its continuance afforded a brilliant light. Next morning it was found that the waterbutts and puddles in the upper part of the village were thickly covered with a deposit of sulphur. Some of the water has been preserved in bottles.

AN EXTRAORDINARY PHENOMENON.—*(To the Editor of the Chatham News.)*—SIR,—On the afternoon of Monday the 4th, between the hours of three and four, I witnessed a very extraordinary sight in the heavens. I have not heard of any one hereabout having seen it. The facts are as follow:—At the time above mentioned I was passing the Mill by the Water-works Reservoir. On the gallery I observed the miller uttering exclamations of surprise, and looking earnestly towards the west. On inquiring what took his attention so much, he said, "Look, sir, I never saw such a sight in my life!" On turning in the direction towards which he was looking, the west, I also was astounded—numberless black discs in groups and scattered were passing rapidly through the air. He said his attention was directed to them by his little girl, who called to him in the Mill, saying, "Look, father, here are a lot of balloons coming!" They continued for more than twenty minutes, the time I stayed. In passing in front of the sun they appeared like large cannon shot. Several groups passed over my head, disappearing suddenly, and leaving puffs of greyish brown vapour very much like smoke. I am, Sir, yours truly,

JAMES E. BEVERIDGE, *Darland, Chatham, Nov. 18th*, 1867.

[Concerning the last of this marvellous trio, we are told that several persons saw this extraordinary phenomenon, and concur in Captain Beveridge's letter.]

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REVIEW.

Results of the Magnetical and Meteorological Observations made at the Royal Observatory, Greenwich, 1865.—(Extracted from the Greenwich Observations, 1865.) 378 pages, quarto.

THIS volume contains the first set of magnetic observations since the instruments have been fairly at work in their new position in the magnetic basement, the various elements being given as read off from the photographic sheets. We cannot help thinking it is a pity that a somewhat similar course is not adopted with respect to the meteorological records, and we should also be glad to see one set of absolute values daily, in addition to the *means* as now given. There would surely be no difficulty in giving the pressure, temperature, &c., at some one hour daily, and we know that if given it would be highly valued.

The approximate mean declination was 20° 32′ 43″ W., and the mean dip 68° 2′ 40″.

Some of the most interesting meteorological elements are given in the following table :—

Meteorological Elements, Greenwich, 1865.

	Barometer at 159ft.			Thermometer.			Humid	Rain.	
YEAR.	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean.	Days.	Amnt.
	in.	in.	in.	o	o	o	Sat: 100		in.
January	30·207	28·390	29·404	50·2	19·6	36·3	86	16	3·32
February	·432	·718	·722	52·7	15·5	36·6	83	19	1·75
March	·204	29·042	·722	58·7	23·7	36·6	79	10	·85
April	·170	·680	·954	81·5	31·9	52·3	73	7	·40
May	·225	·343	29·769	78·5	31·4	56·1	73	13	4·37
June	·358	·120	30·031	87·6	41·2	60·2	70	5	2·45
July	·202	·416	29·797	85·0	47·0	63·8	72	11	2·27
August	·172	·300	·711	78·0	43·2	59·9	80	17	3·97
September.....	·323	·750	30·071	86·0	40·2	63·9	76	1	·16
October	·081	28·824	29·440	71·7	33·5	50·9	87	19	5·90
November	·325	·794	·720	56·4	31·0	44·8	88	18	2·39
December	30·610	29·005	30·055	52·7	29·2	42·7	88	10	·87
Means	...	...	29·783	69·9	32·3	50·3	80	...	...
Extremes ...	30·610	28·390	...	87·6	15·5	...	...	...	...
Totals	...	...	...	...	...	...	...	146	28·70

The records of the thermometers sunk in the ground are somewhat incomplete, the spirit occasionally running out of scale, but the usual results are nevertheless manifest in the retardation of the date of maximum temperature, which at 3 ft. occurred on September 13th, at 6 ft. on September 20th, at 12 ft. on October 11th, and at 24 ft. not till December 6th.

Though last, not least important, is the catalogue of luminous meteors observed during the year, giving full particulars of the paths, size, colour, &c., of 300 or 400 meteors.

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NOVEMBER, 1867.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of nights below 32°.
			inches	inches.	in.							
I.	ENGLAND.	Camden Town	·86	— 1·55	·73	30	4	62·6	1	26·4	28	6
II.		Staplehurst (Linton Park)	1·26	— 1·93	·40	16	8	60·0	1	26·0	29	10
,,		Selborne (The Wakes)	1·06	— 2·48	·55	30	4	58·0	1	20·0	28	19
III.		Hitchen	·61	— 1·53	·39	30	5	55·0	15	26·0	27	9
,,		Banbury	·57	— 1·63	·23	30	9	58·0	1	23·5	28*	15
,,		Wisbech	·73	...	·24	30	8	58·2	1	24·0	28	5
IV.		Bury St. Edmunds (Culford)	·95	— 1·44	·45	30	7	60·0	1	22·0	27	7
V.		Calne	1·15	...	·95	30	3	61·0	15	19·3	28	16
,,		Plymouth (Goodamoor)	2·16	— 3·44	...	...	...	59·0	...	27·0	...	...
,,		Barnstaple	1·08	— 3·06	·58	30	10	...	...	...	...	...
,,		Taunton (Fulland's School)	·81	— 2·29	·76	15	3	...	...	...	...	...
VI.		Shrewsbury (Highfield)	1·04	— ·94	·47	14	8	...	...	...	...	...
,,		Tenbury (Orleton)	1·19	— 1·28	·45	14	10	57·2	1	21·6	29	16
VII.		Leicester (Wigston)	·61	— 1·55	·25	30	5	59·0	15	22·5	27	13
,,		West Retford	...	...	...	...	..	...	...	...	...	...
,,		Derby	·95	— ·68	·47	14	8	55·0	19	25·0	28	7
VIII.		Manchester	2·43	— ·34	1·50	30	7	53·8	15	24·0	28	12
IX.		York	1·16	— ·82	·45	14	7	58·0	5, 9	26·5	28	1
,,		Skipton (Arncliffe)	1·99	— 4·46	·77	16	6	50·0	1	24·0	24	3
X.		North Shields	·99	— 1·71	·45	14	6	55·8	8	31·0	27†	2
,,		Borrowdale (Seathwaite)	2·55	—14·12	·57	27	10	...	...	...	...	...
XI.	WALES.	Abercarn	1·12	...	·67	15	4	55·0	1	29·0	29	3
,,		Haverfordwest	2·21	— 3·46	1·60	30	4	53·0	4, 15	24·5	23	...
,,		Rhayader (Cefnfaes)	1·49	— 3·09	·50	30	9	59·0	...	26·0	..	...
,,		Llanberis (R. Victoria Hotel)	·39	...	·14	30	5	...	...	...	...	...
XII.	SCOTLAND.	Dumfries	·71	— 2·51	·39	30	7	59·0	4	26·5	24	12
,,		Hawick (Silverbut Hall)	·33	...	·13	15	8	...	...	...	...	...
XIV.		Ayr (Auchendrane House)	1·35	— 2·72	·31	13	10	72·0	4	17·0	21	12
XV.		Otter House	...	...	...	...	...	...	...	...	...	...
XVI.		Leven (Nookton)	·43	— 2·61	·21	30	5	56·0	8	31·0	27	10
,,		Stirling (Deanston)	1·23	— 2·29	·48	30	7	56·8	4	22·9	18	16
,,		Logierait	·52	...	·21	30	6	...	...	...	...	..
XVII.		Ballater	·82	...	·35	1	9	54·0	9	23·0	12	10
,,		Aberdeen	·94	...	·42	14	10	51·5	4, 9	28·7	13	2
XVIII		Inverness (Culloden)	·91	...	·20	29	7	52·8	9	33·5	17	0
,,		Fort William	2·06	...	·49	25	13	...	...	...	...	...
,,		Portree	3·57	— 6·91	·78	24	12	58·5	6	29·0	5	2
,,		Loch Broom	3·27	...	·50	30	20	...	...	...	...	...
XIX.		Helmsdale	2·28	...	·59	1, 30	15	...	...	...	...	...
,,		Sandwick	2·93	— 1·07	·74	30	22	52·2	7	34·7	27	0
XX.	IRELAND.	Cork	1·75	...	·63	29	6	...	...	...	...	...
,,		Waterford	2·20	— 1·75	·95	14	9	59·0	4	29·0	28‡	2
,,		Killaloe	1·57	— 3·32	·58	13	6	59·0	1	23·0	28	8
XXI.		Portarlington	·86	— 3·06	·40	14	12	49·5	14	23·0	28	13
,,		Monkstown	1·29	— 1·59	·84	30	8	55·0	14	23·5	29	8
XXII.		Galway	·74	...	·23	13	5	59·0	8	31·0	17‖	3
,,		Bunninadden (Doo Castle)	·72	...	·31	30	9	54·0	4	23·0	29	11
XXIII		Bawnboy (Owendoon)	·80	...	·28	13	11	55·0	4	25·5	27	6
,,		Waringstown	1·09	...	·28	13	10	54·0	4	28·0	8, 28	11
,,		Strabane (Leckpatrick)	1·10	...	·30	13	15	57·0	4	26·0	18	11

*And 29th. †And 28th. ‡And 29th. ‖And 21st & 28th.

+ Shows that the fall was above the average; — that it was below it.

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METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

LINTON PARK.—Northerly winds, high bar. and less R than for many years. Dense fog on morning of 9th.

SELBORNE.—Bar. fell an inch in the four days preceding the 14th, and high winds blew throughout 15th, 16th, and 17th. Fog daily from 3rd to 11th, and on 24th and 25th; it was dense on 9th.

HITCHIN.—The driest November for 20 years.

BANBURY.—A cold dry month; mean temp. 2°·0 below the average. Fog on 8th, 28th, and 29th, and thick fog on 9th and 11th.

WISBECH.—Bar. high throughout, the mean being 30·261 in. Sycamore divested of leaves on 23rd, common poplar on 25th, and walnut on 17th. Constant fog from 9th to 12th.

CULFORD.—A very mild month. High wind on 16th; slight S on 20th.

CALNE.—Very high bar.; northerly winds, and remarkably dry month. Very high wind on 16th, gale on 17th.

ORLETON.—A dry month with an even temp., about 3° below the average, and a high bar. throughout. Max. 30·43 at 9 a.m. 9th. Wind generally from the N. and the air dry. Frequent frosts. Much fog 9th to 15th, followed on 16th and 17th by rough wind from N. and N.E.

WIGSTON.—Temp. below the average. An unusually dry fine month, which has proved most favourable for agricultural purposes. The rainfall, as far as my record serves, is unprecedentedly small, uot being one-third of the average fall during the last 12 years.

DERBY.—A month of remarkable beauty, more resembling October than November. No fogs and only two days of decided R. Seed time all that agriculturalists could desire. It was unfortunately cloudy on the night of the 14th, but enough shooting stars were seen to verify the prediction.

MANCHESTER.—This month has been unusually dry here, more especially looking at the very small number of days upon which R fell.

ARNCLIFFE.—R only on 6 days, the smallest number I have ever registered; a very fine month.

NORTH SHIELDS.—Fog on 14th; H on 16th.

SEATHWAITE.—A singularly fine and dry month. R remarkably small, only one-seventh of the average. So fine a month never remembered.

WALES.

ABERCARN.—A very fine month, generally calm and cold. Fog on 13th and 14th. Windy on 16th.

HAVERFORDWEST.—Finest November for 20 years, chiefly characterised by bright frosts and cloudless sky. Bar. very high throughout, max. 30·615 on 9th. Had it not been for the storm of R and wind, which was very severe from S.E. on the last day, it would have been the driest month of this year, as it was certainly the finest.

RHAYADER.—A remarkably fine month.

SCOTLAND.

DUMFRIES.—Unusually fine for November. On 26th, at 5.44 or 5.45 p.m. a large and very luminous meteor passed from E. to W; it was pear-shaped, and appeared about one-eighth the size of the moon.

HAWICK.—The driest, mildest, and pleasantest November recollected. Windy on 15th.

AYR.—Most seasonable weather throughout; high bar., small rainfall.

NOOKTON.—A month of singularly fine weather, with a minimum of rain; quite unlike November weather.

DEANSTON.—Some S on the hills at the beginning of the month, and frequent frosts at night during it; generally very dry and bright, and very favourable for agriculture. Very little wind. The 14th very cloudy, and no meteors seen.

LOGIERAIT.—Finest November recorded; cloudy on 14th, and no meteors seen.

BALLATER.—An unusually fine month; bar. on 21st, 30·706 in.

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ABERDEEN.—Auroræ on 1st, 2nd, 6th, 21st to 24th, 26th and 27th. A month of remarkably fine, mild, dry weather. H on 2nd, L on 6th, lunar halo on 7th, dense fog on 12th and 29th. On 14th a few meteors were seen between 5 and 6 a.m., but the sky was generally cloudy all night. Very fine meteors were seen on 20th at 7 p.m., and 26th at 6 p.m.—[See also Dumfries.]

CULLODEN.—H on 1st; aurora on 27th; fog on 29th.

FORT WILLIAM.—Very fine in the middle of the month, and the total rainfall only a quarter of the corresponding month of 1866. Cloudy at night on 13th; no meteors to be seen.

PORTREE.—Although October this year did not favour the Highlander's harvest, November has been very fine, and all is stacked in excellent condition. December is setting in very wild.

LOCHBROOM.—Beginning and end of month rainy; the middle very favourable for the herring fishery, which has been more successful than for 17 years. TS on 1st.

HELMSDALE.—Harvest was late in this quarter, but finally secured in good condition during the beginning of this month, when the weather was all that could be wished. Dec. 1, violent storm of wind and S.

SANDWICK.—Rain on 22 days, but not heavy; in fact, the amount is an inch below the average; very high bar. which, even when above 30·5 was accompanied by R and scud. H on 1st, auroræ on 20th, 23rd, and 28th; lunar halos on 12th and 13th.

IRELAND.

KILLALOE.—The driest Nov. in 22 years, except 1856, 1·51 in., and 1858, 1·22.

MONKSTOWN.—Colder and more foggy than usual; temp. on grass below 32° on 19 nights; min. 16° on 29th. Gale on 16th, and severe storm on night of 29th.

DOO CASTLE.—One of the finest Novembers on record. Potatoe digging, which was prevented by the weather in October, was pushed on in November with fair results.

OWENDOON.—Very fine and dry. H on 1st; fog on 5th, 6th, 8th, 9th, 10th, and 14th. Night of 13th rainy and overcast, could not see meteors.

WARINGSTOWN.—Very fine month; small rainfall; favourable to farming operations; large breadth of wheat sown in consequence. Tremendous H shower at 2 p.m. on 1st. Dahlias, &c., killed on 5th.

LECKPATRICK.—Very fine mouth; high bar., light winds, and warm sun for the time of year. Rapid fall of bar. on 30th, preparatory to gale and S of December 1st.

HEIGHT ABOVE SEA LEVEL.

IN a former number* we submitted a proposal relative to the determination of the heights of any number of localities above the mean sea level by means of the publications of the Ordnance Survey, and also by simultaneous barometric observations, which we undertook to reduce, and also to "publish the results" as soon as the discussion was completed. This promise, we think, the majority of our readers would rather see unfulfilled, since it seems to us rather a matter for settlement between ourselves and the observers than for publication, especially as the corrected values will be adopted in *British Rainfall*, 1867. The results will therefore be communicated to the observers very shortly. It may be well to add that the period selected, proved well suited for the purpose, the barometer being steady, and the results generally singularly accordant. In conclusion, we can only say that any of our readers who are uncertain of their altitude, and will send us the position of their house, in the following form—

"The Limes, Johnstone, Derbyshire,
Quarter of a mile South of Johnstone Church,"

shall be assisted to the best of our power.

* *Meteorological Magazine*, No. XVI., May, 1867.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

XXIV.] JANUARY, 1868. [PRICE FOURPENCE. or5s. per ann. post free

CYCLONE IN BENGAL.

ALTHOUGH there is certainly no present proof of community of origin, it is at least a singular coincidence, that almost at the very same moment that Tortola was being laid low by a cyclone unequalled in destructive power for thirty years, "Calcutta was astonished at a return of wet weather," followed in a few days by a violent Cyclone.

The disasters in Bengal were far heavier than in the West Indies, but as only three years have elapsed since the former district suffered from one of the most destructive storms on record, the present catastrophe has been deemed less important than it otherwise would have been. The cyclone of October 5th, 1864, swept over Calcutta in the day-time, yet 50,000 lives were lost, and property worth upwards of two millions was destroyed. In 1867 the lives lost are computed at 3000.

The following extracts from the Calcutta *Englishman* give a vivid description of what is often deficient—namely, the premonitions of the storm.

"For weeks past the weather has been a foremost topic of conversation. The rains had apparently ceased, when Calcutta was astonished, on 26th October at a return of wet weather. During all last week rain seemed threatening, and on Thursday the threat began to be fulfilled. The sky on Friday was overcast and lowering, the pall of cloud was unusually low, and masses of scud were whirled swiftly away to leeward all day long. The gloom of the day was added to by frequent rain-squalls; the day, in fact, was just one of those for which November in England has acquired so unpleasant a reputation. As the day wore on the signs of bad weather increased. About three o'clock the barometer began to show signs of falling, and the wind came down in fiercer gusts. Matters remained in this state till dusk, when it was evident to the most careless that Calcutta was about to be visited by a storm, which would rival the now famous Cyclone of 5th October, 1864. Men went home from office to hurry through dinner and prepare for the struggle, and although some daring spirits went to the Opera, they were the exception. At ten o'clock, the fastenings of doors and windows began to be severely tasked, and the storm rushed over the city with a heavy murmurous roar, like a fierce surf beating on a shingle beach. This roar never lulled until daylight, but every few minutes it swelled up into a thunder of wind and rain, marking the approach of heavier squalls. Up to half-past one the storm was content with rattling doors and windows furiously, but now it forced its way into the well-guarded dwellings of the European portion of the city, and tore off here a sash, here a venetian, here a door. The houses shook under the force of the blows dealt them, and often and anxiously were the time-pieces consulted to see how the night wore away. Soon after two, however, there was a sensible

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abatement of the storm, the gusts were as fierce as ever, but the intervals between them were longer. By half-past three the strength of the gale had greatly abated, and by four the hurricane had become a strong westerly gale, and people began to count up the damage they had sustained, and to hope for daylight, to enable them to ascertain the losses of their neighbours. Few slept last night, and there are few who could wish to pass such another night, or to battle again with a gale which has wrought the city, as much, if not more, injury than even the great cyclone."

"The following is the official report from Mr. Blandford, the Meteorological Reporter, on the storm of Friday night:—On the night of 1st and 2nd November, Calcutta was visited by a severe cyclone, the centre of which passed to the east of Saugor Point and Calcutta, in a northerly direction. Threatening indications were noticed in the telegrams, received on the morning of the 1st, from Saugor Point and Cuttack, and the probability of an approaching storm was strengthened by a report sent from the former place at 12 h. 30 m. These, with the subsequent reports from Saugor Point at 16 h., 17 h. 30 m., and 19 h. were communicated at once to the Master Attendant of the Port, but up to 19 h., the wind at Saugor Point shewed no sign of veering, and it was uncertain whether the cyclone had actually formed. At 20 h. no distinct telegraphic report could be received from Saugor, and the 19 h. telegram is the latest information received thence up to present date. At Calcutta the wind was from N.E., and shortly after dusk became fitful and threatening, the gusts gaining gradually in streugth until they reached their maximum between 2 and 3 a.m. of 2nd (?). The wind was at first from the N.E. veering gradually to N. and to N.W., which was its average direction when most severe. The lowest barometric reading at the Surveyor General's office was taken at 3 a.m., *viz.*, 28·6 inches.

"The maximum force could not be recorded, owing to the destruction of the anemometer at 2 a.m. The storm abated, and the barometer rose rapidly after 3 a.m."

"A native correspondent at Jessore, writing on the 3rd November, sends us the following:—

"'Jessore has been swept by the terrible cyclone, unprecedented in the history of this little station. From the evening of the 29th October to 11 p.m. of 1st November, it rained heavily. At half-past eleven, a burning brilliant cloud was first observed in the north-east corner of the station. All thought at first that it was a fire, but it was not so; for the storm soon began, and changed its direction as the sky-flame changed its position, *i.e.*, from north to east, to south, to west—to north-west, whence in the morning it disappeared. It was not a cloud, for clouds were distinctly seen running fast below it. When it was in the north-east several houses at Jhoonjhoonpoor (a small village north-east of the station) were burnt; when it was in the north-west fire set into some of the houses at Poorono Kuslea (a village north-west of this station); similarly to some houses in another village in the east. I have yet received no news from south and west. The fires may have been accidental, but the brilliant flame, which guided the course and direction of the great cyclone, deserves enquiry. The spiritualists here attribute it to supernatural agency, but let the materialists, or the so-called scientific world explain the phenomenon! It was not a delusion, for it was observed by the majority of the residents. I write you to know this, for you have many literary and scientific readers, who, I hope, will kindly come forward and explain to us (ignorant men) the mystery of this mysterious flame!!!

"'Except a few *pucca* houses, all gone down! Rice crop at once ruined, prospect of winter crop very gloomy, and the people know not what to do. They attribute all these to the sins of their rulers. I am glad, however, to inform you that our magistrates are doing all that humanity could wish, or energy act.'

"This letter mentions a phenomenon preceding the storm which we do not remember to have heard of before, in connection with cyclones. Several correspondents have, however, spoken of a peculiar luminous appearance in the atmosphere at the height of the storm. The subject is one well worthy of investigation."

The following barometric returns show that the rate and amount of depression was much less in the Calcutta than in the Tortola Cyclone-

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and (though the anemometer broke down) there is no doubt that the wind force was proportional to the depression, and far greater at Tortola than at Calcutta; yet the loss of life was greatest at Calcutta, the reason being perhaps that the houses in the West Indies are better adapted to resist the hurricanes which are there of such frequent occurrence.

Reading of Marine Barometer at Calcutta, October 29th to Nov. 2nd.

		Inches.	Fall per hour.	Rise per hour.	Wind.
Oct. 29th—	6 a.m.	30·08	...	...	...
	noon.	·08	·000	·000	...
	8 p.m.	·06	·003	...	...
30th—	6 a.m.	·04	·002	...	...
	noon.	·02	·003	...	...
	8 p.m.	30·00	·003	...	...
31st—	3 a.m.	29·99	·001	...	...
	7 a.m.	·98	·003	...	...
	noon.	·97	·002	...	...
	4 p.m.	·97	·000	·000	...
	8 p.m. *	·98	...	·003	...
	midnight	·96	·005	...	N.E.
Nov. 1st—	4 a.m.	·96	·000	·000	...
	6 a.m.	·97	...	·005	...
	9 a.m.	·97	·000	·000	...
	noon.	·90	·023	...	...
	2 p.m.	·84	·030	...	...
	4	·82	·010	...	...
	6	·78	·020	...	...
	7	·74	·040	...	...
	9	·70	·020	...	N.E.
	10	·58	·120	...	N.E.
	11	·38	·200	...	N.N.E.
	12 p.m.	29·16	·220	...	N.
2nd—	1 a.m.	28·96	·200	...	N.W.
	2	28·90	·060	...	W.N.W.
	3	29·10	...	·200	W.
	4	29·26	...	·160	W.
	5 a.m.	29·50	...	·240	W.S.W.

* At sunset remarked an unusual lurid red haze.

Reading of Barometer at Different Stations.

Stations.	November 1st.				November 2nd		Min. of Barometer.	
	3 p.m.	6 p.m.	9 p.m.	Midngt	3 a.m.	6 a.m.	Readng.	Hour.
Contai, Hidgelle	...	...	29·25	29·25	29·50	29·65	29·18	11.15
Fort Gloucester (Aner.)	29·90	29·86	·72	·30	·40	·76	29·14	1.15
,, ,, (Symp.)	·60	·57	·48	·20	·28	·51	28·90	1.15
,, ,, (Marine)	·68	·63	·51	·08	29·16	·51	·91	1.15
Calcutta (Aner.)	...	...	·54	·00	28·96	...	·70	1.30
,, St. Xavier's Coll.	29·68	29·64	·52	·00	29·00	29·62	·69	1.30
,, (Aner.)	...	·72	·62	·17	·13	·65	·85	1.35
,, Durham	...	·75	·45	·00	·00	·60	·70	1.40
,, (Marine)	29·83	·78	·70	·16	·10	·60	·90	2.0
Cossipore.....	...	·86	·73	·38	·07	·58	·95	2.0
Dum Dum	...	...	·78	·42	·07	·63	·94	2.15
Ooterparah	29·84	29·82	·68	·24	·01	...	·85	2.30

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From the above it will be seen that the maximum rate of depression was about ·25 in. per hour, and that only for a short time; this is about double the rate of fall in this country, but it is only one-third the rate in the West India Cyclones, where the barometer falls *three-quarters of an inch per hour.*

IS THE ROYAL CHARTER GALE PERIODIC?

We anticipate an immediate negative reply to the above query, but that will not deter us from examining the facts, at least such as are readily within our reach.

NOTES ON WEATHER IN OCTOBER.

1820. *London.*—Lowest barometer in the year on the 25th.
1845. *Birmingham.*—Greatest wind force 9 lbs. on 20th at 11·15 a.m.
1846. *Nottingham.*—Greatest rainfall in the year on 19th.
1847. *Uckfield.*—Gale from S.W. on 23rd; showers of rain and hail on 24th.
„ *Cambridge.*—Only once has the bar. fallen suddenly—on 22nd.
1848. *Uckfield.*—Strong gale on 9th; none mentioned afterwards.
1849. „ Dull month, no gales.
1850. „ Gale on 6th; on 23rd continuous rain and heavy S.W. gale.
1851. „ Mostly fair and mild; no gales.
1852. *Helston.*—Barometer lowest on 26th.
1853. *Uckfield.*—Severe thunderstorm, with heavy rain and hail, on 27th.
1854. *Hull.*—Lowest barometer in month on 22nd.
1855. *Uckfield.*—Barometer very low during the last week. Very stormy 4th to 6th, and about 26th.
1856. „ Remarkably fine throughout.
1857. No particulars at hand.
1858. *Norwich.*—High wind on 7th and 19th; stormy on 29th.
„ *Nottingham.*—Gale on 18th and 19th; barometer high at the end of the month.
1859. Royal Charter Gale on 25th.
1860. *St. Kilda.*—Hurricane on 3rd.
„ *Dublin, Sheffield, Glasgow.*—Lowest barometer on 18th.
„ *Helston.*—Lowest barometer on 11th.
„ *Manchester.*—Lowest barometer on 13th.
1861. *All Stations.*—Lowest barometer on 11th; no gales, and high barometer at the end of the month.
1862. *Bedford, Retford, Sandwick, &c.*—Very stormy from 19th to 27th.
„ *Silloth.*—On 19th barometer fell an inch in 8¼ hours.
„ *Birmingham.*—On 19th barometer "lower than since Royal Charter storm."
1863. *Penzance.*—Gale on 13th.

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1863. *Haverfordwest.*—From 24th to 31st very stormy, with hail.
" *Markree.*—Gales from 28th to 30th.
" *Calne, Leckpatrick, Killaloe, Dumfries, &c.*—A series of gales, with hail and thunder, on 29th, 30th, and 31st.
" *Sandwick.*—Gale blowing 74 *miles per hour* on 30th.
1864. *Truro.*—Minimum barometer on 22nd.
" *Boston.*— " " " 23rd.
" *Retford.*— " " of the year on 23rd.
" *Penzance.*—Gales from 21st to 27th.
" *Aldershot.*—Gales from 1st to 5th, and 19th to 24th.
" *Dumfries.*—Violent gale on 20th.
" *Scotland and Ireland.*—Excessive, if not unprecedented, rains from 19th to 24th.
1865. *London.*—Lightning on 29th.
" *Selborne.*—Splendid aurora on 19th; thunder on 29th.
" *Banbury.*—Lightning on 7th, 26th and 29th.
" *Wisbech.*—Gale (12lbs.) on 25th; squally at end of month; auroræ on 19th and 26th.
" *Culford.*—High wind on 25th.
" *Taunton.*—Thunderstorm at 4.30 a.m. 25th.
" *Arncliffe.*—Violent storm on 24th, with snow and hail.
" *Haverfordwest.*—Heavy gale 29th to 31st; much damage to shipping.
" *Portree.*—Gale on 24th from S.W.; 25th, N.W. and N.; 27th, heavy gale from N.

[For further details see *British Rainfall*, 1865, pages xxxiii.-iv.]

1866. *Linton.*—No high winds.
" *Wisbech.*—Strong wind only on one day, 30th.
" *Seathwaite.*—Tremendous rain on 29th.
" *Haverfordwest.*—First fortnight calm, afterwards stormy, especially 28th and 29th when it blew a heavy gale.
" *Deanston.*—Little or no wind except on 29th.
" *Ballater.*—Blew hard on 29th.
1867. [See meteorological notes, *Meteorological Magazine*, pp. 121 and 122.]

So much for the evidence; to what does it amount? Apparently to this—that in two Octobers out of three, there will be a gale on or about the 25th, and that it is frequently accompanied by electrical phenomena, thunder, lightning, and hail, also by snow. It would seem that gales in the middle of October are rare, and that they generally occur in the first or the last week. We have thrown out the suggestion, and, so far as time permits, attempted to test it; we leave it with the hope that some one will find leisure to confirm it or to contradict it.

[The above article was in type before we had heard of the cyclones of Tortola and Bengal; far be it from us to suggest that in their dates and almost simultaneous occurrence there is either proof of common origin, or confirmation of the *possibility* shadowed forth above.]—ED.

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REVIEWS.

The Life Boat, No. 66, October, 1867.—Published at the Office of the National Life Boat Institution. 24 pages and map.

THIS ably conducted quarterly is as interesting as usual. It begins with a very impartial article on "The salvors of property on the English coasts," discussing the questionable demands on foreigners often made by the 'long shore men of the Suffolk coast, and which is most appropriately introduced by the lines of Burns—

> "Oh! wad some power the giftie gie us,
> To see oursels as others see us,
> It wad frae mony a blunder free us."

Then follow notices of additional life boat stations, and a capital map, showing the localities and number of wrecks in 1866, and various tables. One of these raises a question which merits examination; it is this: during the six years 1859-64, the average number of casualties with the wind blowing a strong gale was 15, and the greatest, 16 per cent. of the wrecks in all weathers. In 1865 the number was doubled, being 33 per cent., and in 1866, 32 per cent. Does this bear any connection with the stoppage of the FitzRoy storm signals?

Report of the Sanitary Committee of the Town of Nottingham.—Nottingham: J. N. Dunn, 1867; 25 pages.

SHOWS that they look sharply after their business, and are conscious of the important bearings of meteorology on sanitary matters.

Proceedings of the Manchester Literary and Philosophical Society Vol. VII. No. 4.

THIS is meteorologically a most interesting and important number, almost every article bearing on radiation in one or other of its many branches. The first communication is by Dr. J. P. Joule, F.R.S., "On a Thermometer unaffected by Radiation," which consists of a double cylinder, in the inner of which hangs a spiral of fine wire suspended by a filament of silk, and carrying a mirror; this instrument is so delicate that 1° Fahrenheit produces an entire revolution of the mirror. The second paper is an elaborate discussion of the Oxford solar radiation observations, by Mr. Baxendell, F.R.A.S.; the conclusions arrived at being—

1st. That the calorific intensity of the sun's light is subject to periodical changes, the maxima and minima of which correspond respectively with those of solar spot frequency.

2nd. That the intensity of a ray of direct sunlight on its arrival at the earth's surface, in the latitude of Oxford, is greater in April and September than in June, when the sun's meridian altitude is greatest.

3rd. That the curve representing the mean monthly values of solar radiation on cloudless days has its times of maxima and minima corres-

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ponding with those of the curve representing the mean monthly diurnal ranges of the magnetometer.

4th. It seems probable that the heating rays of the sun consist of two kinds, differing considerably in intensity, and being subject to periodical changes, the times of maximum of one kind and those of minimum of the other corresponding respectively to the maximum frequency of solar spots.

5th. That the oscillations of mean daily temperature are intimately connected with the changes which take place in the earth's horizontal magnetic intensity.

In these deductions Mr. Baxendell has opened new paths of investigation, which we hope will soon be well trodden. But we trust he and his followers therein will look well to the data they employ, and if they elect to proceed upon black bulb thermometers without jackets, we would advise them to clear away as far as may be the uncertainties inseparable from those instruments. We press this point strongly, because Mr. Baxendell terms the Greenwich observations "anomalous and unsatisfactory," which may be the case, but is not to our mind at all proved by the evidence quoted.

"Take, for instance, any winter month—say, December, 1857. The mean difference for the month between the maximum in sun and the maximum in shade was only 1°·7; at Oxford it was 6°·1. The highest value during the month was 4°·5 at Greenwich: at Oxford it was 19°·0. At Greenwich there were only seven days on which the difference exceeded 3°·0: at Oxford there were seventeen. And yet at Greenwich the month was unusually fine and dry, only 0·36 of an inch of rain fell, and several days appear to have been nearly if not quite cloudless. Under these circumstances, it is difficult to understand why the black bulb thermometer, if properly exposed, did not register much greater differences."

Surely the smoke of the millions of London chimneys is ample reason for diminished intensity of solar action, was our first impression on reading this; but surely a Manchester man would never forget *smoke*. We have therefore investigated the question, and although not so thoroughly as we hope to do on a future occasion, believe the results are sufficiently interesting to merit notice.

In order that *all* may be able clearly to understand the points at issue, we must premise a few definitions.

Max. in air = Highest temperature of air in perfect shade.

Max. in sun = Indifferently applied to black bulb thermometer, whether in a vacuum jacket or not.

Amount of solar radiation = Excess of reading of either form of black bulb thermometer above temperature in shade.

Black bulb max. = A maximum thermometer with the bulb blackened so as to retain the heat which falls upon it.

Vacuum black bulb = Similar to the above, but enclosed in a glass jacket, and with the bulb in the centre of a glass sphere about 2 inches in diameter, whereby the wind is prevented from carrying off the heat imparted to the bulb.

Let us first see how the Greenwich returns agree with the other metropolitan stations; and as there were in 1857 only two others pro-

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vided with black bulb max. thermometers, and as moreover January, 1857, is recorded at Greenwich to have had the same solar radiation as December, 1857, we will take both cases :—

Stations.	Amount of Solar Radiation. Ordinary Black Bulb.	
	Jan. 1857.	Dec. 1857.
Whitehall	1°·3	2°·9
Paddington.....	1·8	1·1
Mean	1·55	2·0
Observed at Greenwich...	1·7	1·7
Difference	+ 0·15	− 0·3

From this it is abundantly clear that if Greenwich was wrong, so were the other metropolitan stations.

We will now adopt another mode of examination—viz., by tabulating a few results from other stations :—

	Oxford (6 years).		Camden Town (7 years).	
	Amount of Solar Radiation, Ordinary Black Bulb.		Amount of Solar Radiation, Vacuum Black Bulb.	
	Degrees.	Per Cent. of Monthly Mean.	Degrees.	Per Cent. of Monthly Mean.
January ..	5·51	52	9·4	38
February...	9·16	86	17·2	68
March	10·08	95	25·9	103
April	13·23	124	33·1	131
May.....	12·90	121	35·9	142
June.....	12·93	122	37·5	149
July.....	13·81	130	37·8	150
August ...	14·03	132	35·9	143
September.	13·71	129	31·8	126
October ...	9·66	92	20·1	79
November.	8·00	75	11·8	47
December..	4·50	42	6·0	24
Mean ...	10·6		25·2	

From this it appears that the amount of radiation indicated by vacuum thermometers is twice that by unprotected ones, and if so, we at once establish the necessity of clearly discriminating between the two classes of instruments. We also see that even in the mean of seven years, and with a thermometer in vacuo, the radiation in December in London is not one-sixth of what it is in the summer; hence again we see that it is no proof of the Greenwich observations being wrong to quote a month wherein the solar radiation was 1°·7; why one-sixth of the *mean* Oxford summer value is 2°·2.

The subject is further elucidated by the following diagrams. Fig. 1 shows the monthly march of the sun and shade temperature during

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METEOROLOGICAL NOTES ON THE MONTH.

Abbreviations.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

Linton Park.—The first 11 days wintry, afterwards chiefly dull, raw, and cold. High winds on 1st, with bar. 28·65. Dark nights and dirty roads the prevailing features of the latter part of the month.

Selborne.—Fog on 25th and 30th, and on the 27th a very dense one; diffused aurora on night of 22nd. Bar. 28·48 on 1st; the fluctuations both of the thermometer and barometer, as well as the wind, have been most remarkable.

Banbury.—Dense fog on 26th and 27th.

Wisbech.—Gale on morning of 2nd, 14 lbs.; lunar halo on 9th and 10th; fog on 25th and 26th.

Culford.—High wind on 1st; S on 2nd, 3rd, 6th, 7th, 8th, 18th, and 20th; dense fog on 26th.

Orleton.—Very warm on the 1st, then cold and frosty till the 11th, warm and pleasant till the 18th; the remainder of the month cold and frosty, with much fog, especially on 26th and 27th; frequent falls of fine R with S occasionally, but not remaining on the ground. Temp. more than 2° below the average of the month; very cloudy, violent winds, &c.; low bar. on 1st and 2nd.

Wigston.—Great and sudden changes in the weather during this month; frequent S showers, and more than the usual number of frosty nights.

Manchester.—Fine lunar halo on 10th in evening.

Arncliffe.—A very fine month, dry and clear.

North Shields.—Lunar halos on 6th, 8th, 9th, and 14th; fog on 1st & 27th.

Seathwaite.—Nearly 4 inches below the average, though having eight days on which the fall exceeded an inch. A moist, damp month, with but little frost; last week remarkably fine.

WALES.

Abercarn.—Heavy rain storm on 1st, bar. 28·6; on the 2nd a great and sudden change of temperature, the max. being 51° in the day and 31° at night. A dry, calm month, generally fine and genial weather, but cold.

Haverfordwest.—December commenced cold, wet, and stormy; heavy fall of S, with severe gale from N.N.W., followed by sharp frosts; the month generally was about the average of cold, wet, and frost, there having been eleven frosty nights; the year ended with intense frost, clear sky, and N.E. wind.

Cefnfaes.—A month of variable weather; nights frosty, rain in the afternoons; prevailing winds, N.W. and N.E.

SCOTLAND.

Dumfries.—The weather has been variable, but on the whole favourable for the season; a few days' keen frost in the first week; the second week fine and mild; in the third week some frost, followed by several foggy days; the month closed fine and frosty. Temp. 3°·5 below that of corresponding months; S on 2nd, 5th, 18th, and 20th.

Hawick.—December, except at the beginning of the month, has been mild, moist, and misty. All kinds of farm out-door works have been prosecuted with vigour, and ploughing is much farther advanced than it usually is at this season of the year; fortunately, also, for out-door labourers, the openness of the weather has allowed all sorts of work to go on without interruption.

Auchendrane.—The amount of cloud and the temperature are below the average (for December) of 11 years; as is also the velocity of the wind, but there was a very severe storm of the rotating kind on the 1st and 2nd. The rainfall, though considerable, is below the average; the temperatures have been variable, indicating the alternating influence of the Polar and Equatorial currents. The weather throughout December may be stated as very fine for the season of the year, and very superior to that of December, 1866.

Nookton.—Month variable—mild and fine, again cold and stormy.

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DEANSTON.—Gale on evening and night of 1st from N.N.E. ; also on the night of 6th from N.W. ; weather very dry till the 14th ; no S during the month, except about three-quarters of an inch on the evening of the 20th, and no severe frosts, 22° being the lowest temp.

LOGIERAIT.—A continuance of strong easterly gales from 1st to 8th ; considerable rainfall on 14th and two following days. On the whole a very fine month, many of the days quite spring-like.

BALLATER.—Sharp S storms in early part of the month ; latter part fine for the season, with a steady high bar. Bat seen flying on the evening of the 26th. Fresh S storm commenced on the 31st ; it has come on about the same time for the last four years.

ABERDEEN.—Bar. and Ther. a little above the average, and rainfall a little below it. N.W. and S.W. winds rather more frequent than usual ; but the pressure rather less. The month, with the exception of the short sharp storm at the commencement, was mild, quiet and dry for the season. Auroræ on 3rd, 18th, 24th, and 27th. L on evening of 7th, 12th, 13th, 14th, 16th, 17th, 19th, 25th, and 27th ! H on 2nd and 20th ; fog on 21st ; lunar halo on 9th.

CULLODEN.—S on the 1st, 2nd, 3rd, 5th, and 6th ; H on 13th; and L on 14th.

ROSSE PARSONAGE.—Nothing special to say of the month of December, and the year ended seasonably with hard frost. Much S with N.E. wind on the 1st ; S low on the hills on 17th ; L on 16th.

PORTREE.—A tremendous gale from 2 a.m. on the 1st till 4 p.m. on the 2nd with H and S showers ; afterwards the month was very mild and open, but, as usual, very wet. T L on the evening of 16th, and bar. only 28·955 corrected ; falling stars on the evening of the 17th.

LOCHBROOM.—As November ended so December began, very stormy, and continued of the same unchangeable character, only varying in form and intensity, until the 20th, when it began to abate, by the 23rd it had become beautiful weather, which continued to the end of the month. During the month we had an inch of R on three days, two in succession, and R on every day except the last three.

SANDWICK.—December has been rather drier and colder than the mean ; the first part of the month was cold and stormy, while the last nine days were dry, mild, and moderate, and the last three unprecedentedly calm. Ground covered with S on the 1st ; gale from 6.45 a.m. on 1st to 7 p.m. on 2nd, wind from 50 to 60 miles an hour. It will be noticed that the gale of the 1st commenced much earlier than in England, as is generally the case with a gale from the N. ; it was also very sudden. Auroræ on the 1st and 31st. Large lunar halo on 4th. Gale on 22nd from noon till 8 p.m., 45 miles an hour.

IRELAND.

MONKSTOWN.—Severe gale commenced suddenly at 1 p.m. on the 1st. Very dense fog on the 27th. Commencement of month cold, but the latter half was at times mild and warm, accompanied by a good deal of fog and damp. Lunar halo 8 p.m. on 3rd.

DOO CASTLE.—1st and 2nd were most tempestuous, H showers very fierce ; from 7th to 25th mild and open, from which time to close of the month we have had pretty severe frosts.

OWENDOON.—More than an inch of S fell on the 1st, some of which remained for three or four days.

WARINGSTOWN.—Heavy squalls and S showers on the 1st and 2nd ; a fine month on the whole, very favourable to winter work ; rainfall under the average ; very little frost.

LECKPATRICK.—First week S with northerly winds ; on 1st bar. 29·165, wind N., S all day ; on 2nd, bar. 29·969 ; latter part of month mild and fine. Laurels throwing out their flower buds, wild primrose and Christmas rose in flower.

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